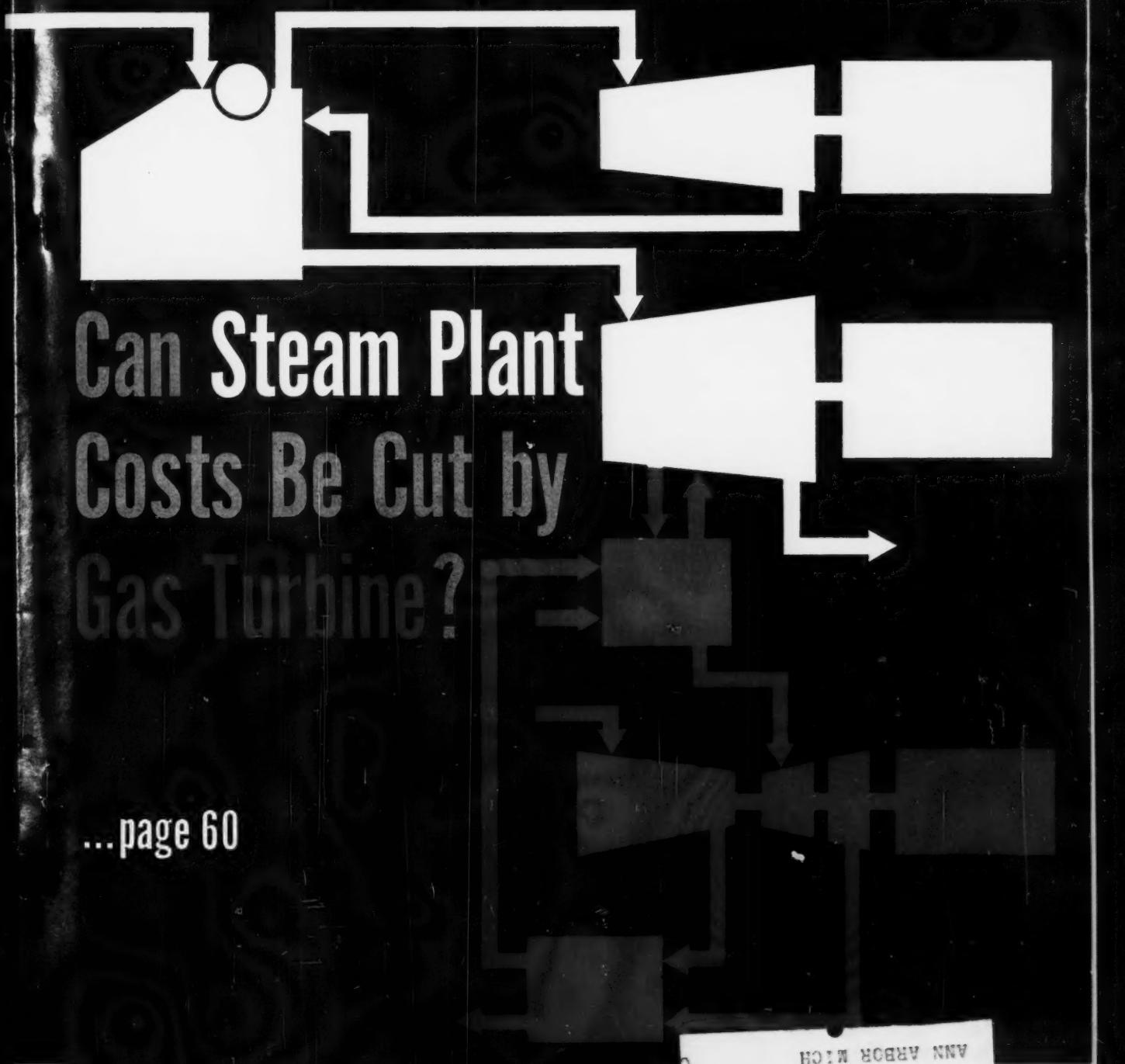
The Electrical Industry's Weekly Magazine

March 9, 1959

Electrical World

Price 50 Cents

A McGraw-Hill Publication



Can Steam Plant Costs Be Cut by Gas Turbine?

...page 60

Union Electric's Disaster Plan in Action ...

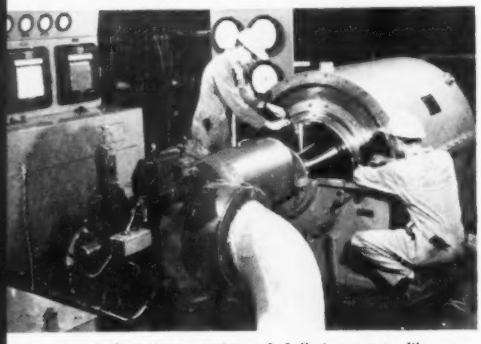
STEVENS RICE GS %
UNIVERSITY MICROFILMS IN
313 N 1 ST
ANN ARBOR MICH

How General Electric is developing better steam turbine-generator service

Engineering seminars held at factory by men like J. E. Downs, Mgr.—Turbine Engineering, inform field service representatives of latest advances. Average professional experience of each local G-E service representative is 17 years.

Completely integrated service—from initial order of a turbine-generator throughout its operating life—is an *added value* available to purchasers of General Electric steam turbine-generator units. Experienced field representatives and local specialists, backed by a headquarters Product Service organization form an integrated service effort designed to help electric utilities achieve more economical generation of electricity.

Here are some ways that G-E service helps maintain the product superiority built into each unit:



Laboratory testing of full-size parts like new thrust bearing (above), other continuing studies, confirm component design improvements.

INSTALLATION SERVICE STUDY TEAM helps simplify field erection by continually studying methods for reducing installation time and cost. It also seeks easier inspection procedures by suggesting appropriate improvements in equipment design.

PERFORMANCE INTERPRETATION helps owners evaluate abnormal sectional pressures and efficiencies, loss of capacity, and other operating irregularities. General Electric initiates tests to prove new designs, and aids owners in conducting their own performance tests on duplicate machines.

ENGINEERING CONSULTATION is continuously available from factory components. Here electrical and mechanical engineers specialize in providing prompt supporting attention to problems that may arise during the life of your unit.

MATERIALS AND PROCESSES LABORATORY ASSISTANCE is offered for any unusual service requirement. Nearly 300 physicists, chemists, specialists and technicians are available for field studies, consultation, and advanced nondestructive testing.

MAINTENANCE TASK FORCE establishes procedures to speed repairs and minimize outages by: assuring efficient repair routines, carefully analyzing shop operations to eliminate uncertainties, and coordinating our action with owner's requirements.

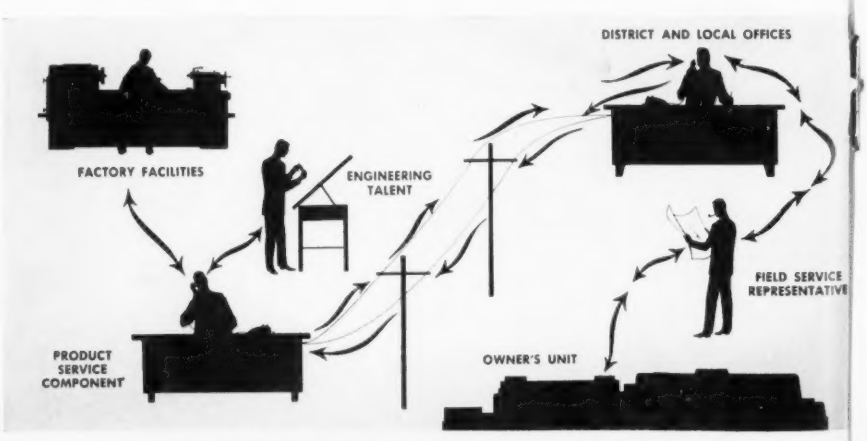
MATERIAL PROCUREMENT ADVANTAGES help reduce downtime. Large volume production, a backlog of currently approved materials such as composite forgings, tubing, and bar stock, and an efficient purchasing organization constitute power aids in meeting emergency requirements.

General Electric's integrated service program of KEEPING POWER MAKERS ON THE LINE provides a major *added value* that helps increase system efficiency and reliability, and reduce operating expenditures. For more information on this Program, contact your nearest G-E Apparatus Sales Office or write for Bulletin GED-3666 "Keeping Powermakers on the Line." General Electric Co., Section 301-392, Schenectady 5, N. Y.

MORE POWER TO AMERICA

GENERAL ELECTRIC

Engineering evaluation at plant site by G-E specialists improves installation time and costs.



Two-way flow of service information through Product Service component permits close liaison between factory personnel and field representatives on specific service problems.

Electrical World

Vol. 151, No. 10 MARCH 9, 1959

Published for 85 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

In This Week's Issue

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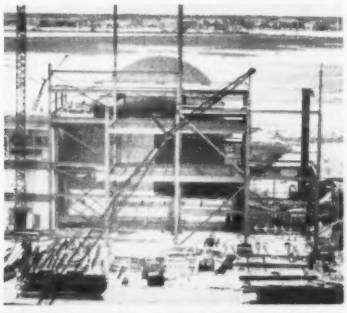

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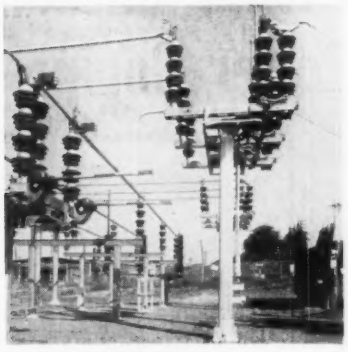

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First cost of structure same as lattice work previously used, but savings come in lower maintenance.....p 59

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In Idaho Power's brand new East Gate Substation at Twin Falls, Idaho, CM-OT control cable is used on control circuits involving transformers, regulators, metering devices and circuit breakers. Much of the equipment is located in the yard, with cables going underground and up into the main control board.

"We expect 30 years' service from this direct-burial cable," says Idaho Power Company

On its substations along the Snake River, Idaho Power Company uses a direct-burial cable that eliminates the need for conduit or pipes . . . provides complete resistance to soil alkalinity, severe temperature fluctuations and active rodents, as well as excellent mechanical protection.

It's Okonite's control cable with CM-OT (Patent No. 2722562) finish—a lightweight, flexible cable of great compressive strength. Heart of CM-OT construction is a corrugated bronze tape that gives unusually high compressive strength. The corrugated tape is bonded to a tough wall of Okoprene, reinforced by an Okoprene-filled tape overall. This composite covering provides a permanent barrier against rodents, moisture, soil alkalies, acids, oils, sunlight or mechanical damage.

It will pay you to learn more about CM-OT quality cable constructions with corrugated bronze tape protection. Send for Bulletin EW-1121, The Okonite Company, Passaic, New Jersey.

Corrugation = strength plus lightness

Just as corrugated construction adds strength to underground pipes, so corrugation of shielding tape permits the construction of CM-OT—the stronger, lighter, more flexible and more easily handled cable.

where there's electrical power . . . there's **OKONITE CABLE**

6201

Your Fellow Readers Around the World

Industry information, broadly available to U. S. utilities through business and technical magazines, is highly prized abroad.

Commerce Secretary Lewis Strauss last week reported that the libraries of trade magazines displayed at foreign trade fairs are often the top attraction at U. S. exhibits.

You may be interested to know that the news and technical information you will find in this issue will be shared by fellow readers around the globe during the next few weeks. They are found on every continent: Europe (576 subscriptions), Asia (452 subscriptions), Africa (43 subscriptions), Central and South America (495 subscriptions) and Australia (107 subscriptions). Utility men in faraway Thailand are receiving 6 subscriptions. Those in Hong Kong get 3, and men in the Union of South Africa buy 27 subscriptions.

Each week more than 3,000 copies of Electrical World are mailed abroad and we would estimate that at least 15,000 readers share these copies. We have no way of knowing the readership behind the iron curtain but suspect that copies reproduced there may well reach several thousand management men and engineers.

Fischer Black

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ELECTRICAL WORLD

Vol. 151, No. 10, Mar. 9, 1959

Published weekly by McGraw-Hill Publishing Co., Inc., James H. McGraw (1860-1948), Founder. **Executive, Editorial, Circulation and Advertising Offices:** McGraw-Hill Building, 330 West 42nd Street, New York 36, N. Y. Printed at 99-129 North Broadway, Albany 1, N. Y. See panel at right for information regarding subscriptions or change of address.

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Subscriptions are solicited from executive, supervisory, and engineering personnel in electric utilities, manufacturing companies, and related fields; and from consulting engineers and electrical engineers in industry. Position and company connection must be indicated on subscription orders. Send to address shown in box at right.

United States and Canada subscription rate for individuals in the field of the publication $6.00 per year; single copies 50 cents. Other Western Hemisphere and the Philippines $20.00 payable in advance and other countries $30.00 payable in advance.

Second-class postage paid at Albany, N. Y.

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Postmaster . . . Please send form 3579 to Electrical World, 330 W. 42nd St., New York 36, N. Y.

Change hats
with your maintenance man . . .

You'll find out . . .

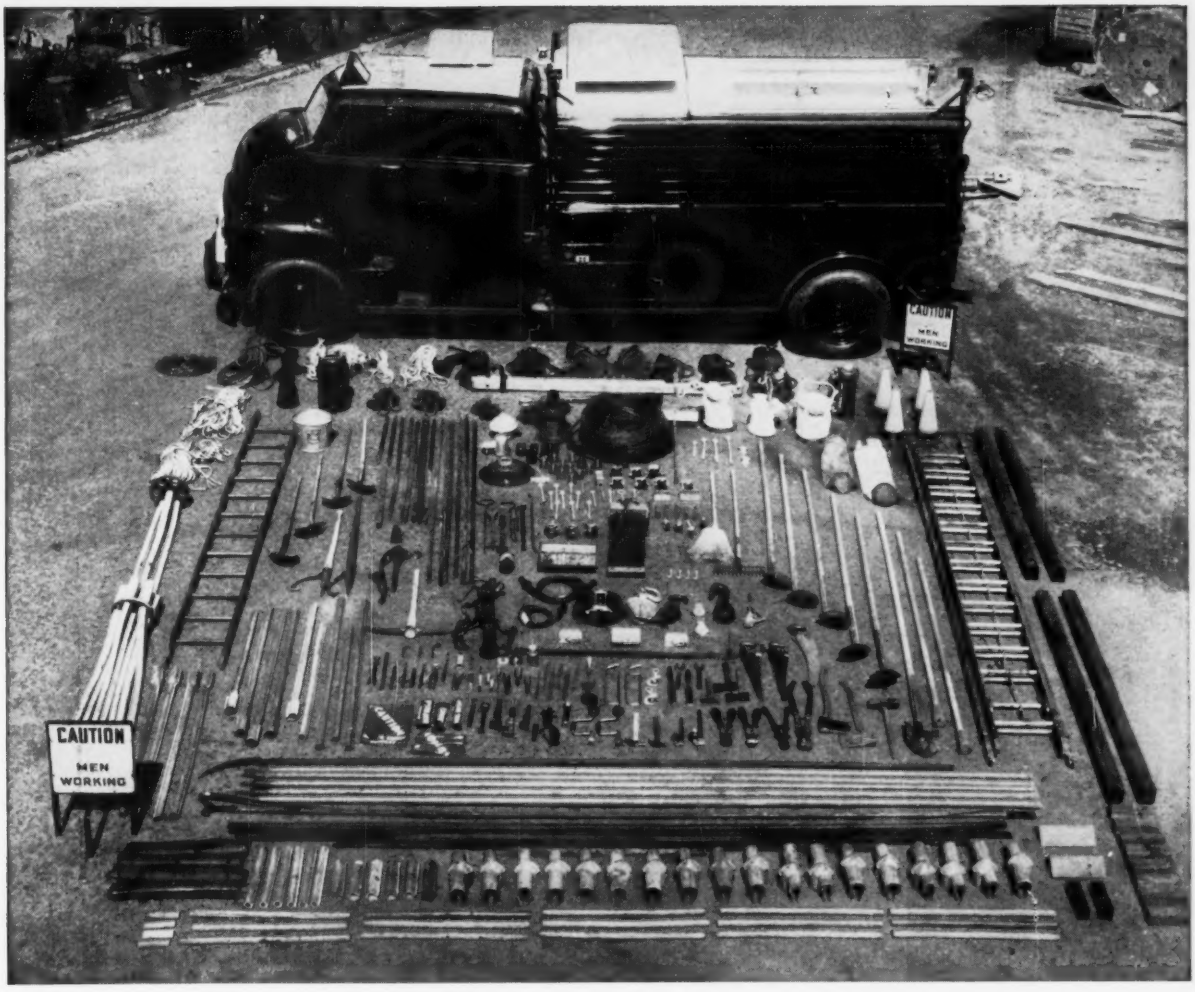
Vertical Lift Metal-clad is safer; you can see when it's disconnected

Peace of mind means a lot when your work involves contact with thousands of volts of electricity. Ask your maintenance man which make of metal-clad gives him peace of mind, and he'll tell you G-E Vertical Lift. He can see when the primary disconnects are parted—no need to guess whether or not the breaker is safely open. And, all live parts are automatically shielded as the breaker disconnects.

Before you buy your next switchgear line-up, consider your maintenance man and the see-able peace of mind only Vertical Lift Metal-clad can give him. General Electric Company, Schenectady 5, New York. 511-32

Progress Is Our Most Important Product

GENERAL ELECTRIC



Look at your line truck equipment needs from this angle . . .

Here's a poles-eye view of a typical utility line truck showing the wide variety of construction and maintenance tools and safety equipment your linesmen need for most day-to-day jobs. But—without exception—each and every item shown can be ordered conveniently from your nearby Graybar office or warehouse . . . and in every case you get the type and quality needed to assure speed and efficiency on the job *plus* long years of satisfactory service. All are products your linesmen know and respect—products that have been tried, tested and proven in the field by scores of companies just like your own.

Remember, when you order "via Graybar", you save the time and expense of multiple inquiries, for you can select, from this single source, the items best suited to your needs from among the products of over 200 of the nation's leading manufacturers.

Graybar is thoroughly familiar with utility requirements. Further, your nearby Graybar Representative stands ready to help as a convenient source of information on everything needed for pole-line construction and maintenance. And should you be faced with an out-of-the-ordinary problem, call on the experience of a Graybar Outside Construction Specialist for a consultation. We'll welcome your inquiry!

511

CALL GRAYBAR FIRST FOR . . .

Graybar Everything Electrical

GraybaR ELECTRIC CO., INC.
420 Lexington Ave., New York 17, N. Y.

IN OVER 130 PRINCIPAL CITIES

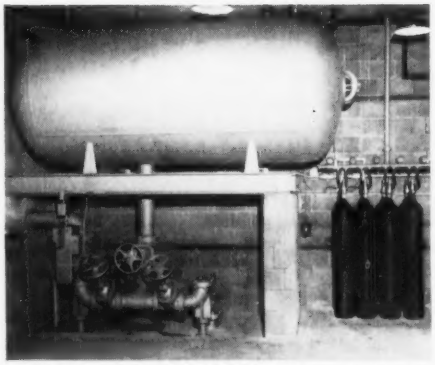
Grinnell Selfcon® Water Spray Systems

To bring the proven effectiveness of water spray protection to locations where adequate water supplies are not always available, Grinnell developed its Selfcon System.

This system consists of a water storage tank and cylinders of compressed nitrogen gas, safely located out of the hazard area, and connected by piping to the water spray nozzles in the area to be protected. Automatic fire detecting devices are connected back to the nitrogen cylinder releases.

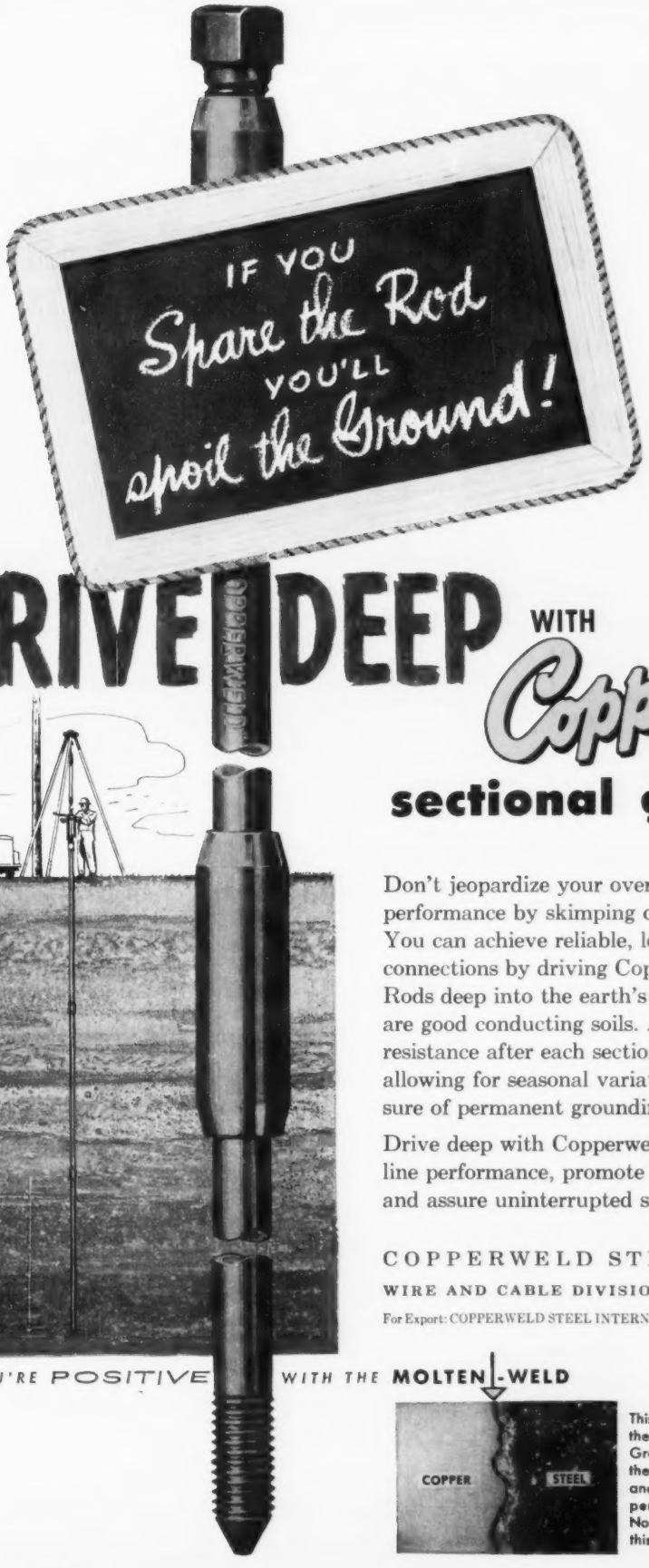
Should fire break out, nitrogen is quickly released into the water tank, raising the pressure so that water is discharged from the spray nozzles with maximum extinguishing effect. The water capacity of the system provides a safety factor well in excess of extinguishing time.

An engineer from Grinnell's Fire Protection Division, which introduced water spray protection in America, will gladly explain more about the operation of this system. Contact Grinnell Company, Inc., Providence 1, R. I. Branches in principal cities.



Building located out of hazard area houses both water storage tank and pressurized nitrogen gas in cylinders.

Manufacturing, Engineering, and Installation of Fire Protection Systems since 1870



DRIVE DEEP WITH Copperweld®

sectional ground rods

Don't jeopardize your overhead line performance by skimping on ground rods. You can achieve reliable, low-resistance ground connections by driving Copperweld Sectional Ground Rods deep into the earth's sub-surface where there are good conducting soils. And by measuring resistance after each sectional rod is driven—allowing for seasonal variation—you can make sure of permanent grounding protection.

Drive deep with Copperweld! You'll improve line performance, promote safety, avoid damage, and assure uninterrupted service.

COPPERWELD STEEL COMPANY
WIRE AND CABLE DIVISION *Glassport, Pa.*
For Export: COPPERWELD STEEL INTERNATIONAL COMPANY, New York

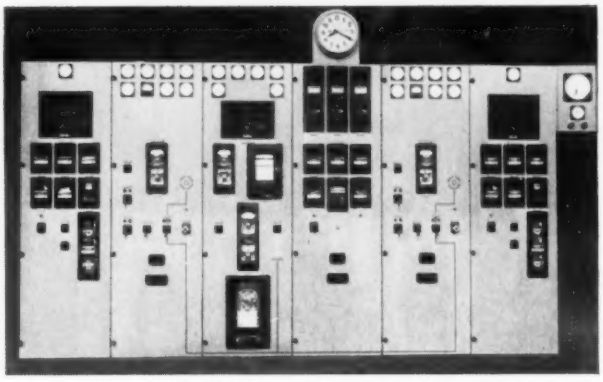
YOU'RE POSITIVE WITH THE **MOLTEN-WELD**

This microphotograph of the weld area of Copperweld Ground Rods shows how the grains of copper and steel alloy to form a permanent, continuous weld. No other process achieves this inseparable union.

in metal-clad switchgear...

Reliability

is born of many men's efforts



Indoor metal-clad power plant switchgear rated 4160 volts, 3 phase, 60 cycles supplied to a partially attended generating station.

It started with a directive—"Make it the best!" A creative team set out to implement this decision. Engineers, designers, production men, and marketing personnel—all took up the challenge. What was *then* good gave direction. They added their talents, their skill, their experience—up-to-date application requirements—designing, testing, redesigning until drawing board plans were translated to market place reality. Out came metal-clad switchgear preeminent in strength, simplicity, and performance. They *had* made it the best!

Type DST air circuit breaker—5 kv, 250 mva, 1200 amps.

From simple feeder circuits to complex generating station protection—when you specify Federal Pacific metal-clad switchgear, you specify reliability. Proof is yours for the asking. Write Federal Pacific Electric Company, Newark, New Jersey for Catalog 3-440—sixty-four pages of the latest in metal-clad switchgear information.

FEDERAL FPE PACIFIC

The Best in Electrical Distribution and Control Equipment

The Electrical Week

LATE NEWS ▶ **More TVA curbs should be enacted President Eisenhower believes,** says GOP House Leader Halleck. Top GOP group, in session with Ike, agreed TVA should: 1. Pay annually to federal government the going interest rate on its investment. 2. Have revenue bonds adequately regulated. 3. Be limited on service area. Bond legislation hearings have been set for March 10-11 by House Public Works.

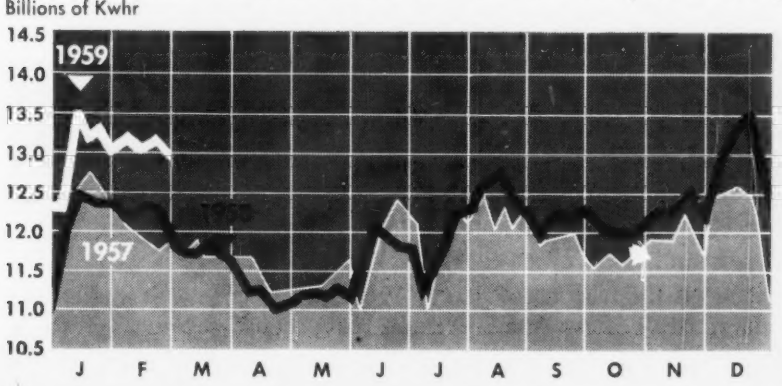
UAW rejects Allis-Chalmers bid for talks to end strike that began Feb. 2, holding out for central negotiation of "any and all issues". A-C proposed local talks on local issues, with central discussion of others. There have been no negotiations since strike began.

Bituminous coal operators, UMW, railroads, utilities join in forming National Coal Policy Conference designed to promote interests of coal industry. Among objectives of the labor-management group are: Elimination of waste in A-power development, broadening of coal markets, and action to end "dumping" of oil and gas.

N. Y. Power Authority files alternate Niagara plan with FPC, providing for a 45,000 acre-ft reservoir, 10 ft higher, and entirely off Tuscarora Indian land. Although firm capacity will be cut from 1.8 million to 1.7 million kw, NYPA says it can still produce 4½-mill power, compared with 7-mill Canadian or steam power.

Management changes . . . EEI appoints John Thornborrow (manager of public utility investments of Northwestern Mutual Life Insurance Co, Milwaukee, Wis.) as director of economics and statistics, succeeding W. B. Gesell . . . Anaconda Wire & Cable elects C. B. Peck, Jr, and J. L. Tindale as commercial vps . . . J. T. Kimball, vp and general manager of Idaho Power, becomes executive vp and assistant to the president of American Foreign & Power . . . Stone & Webster Engineering elects F. W. Argue executive vp and A. L. Hartridge financial vp.

WEEKLY POWER OUTPUT—UP 9.9% (Week ending Feb. 28), Kwhr 12,972,000,000



Per Cent Change From Previous Year

	Feb. 14	Feb. 21	Feb. 28
Total U. S.	+ 6.0	+ 7.5	+ 9.9
New Eng.	+ 8.0	+ 9.7	+ 8.9
Mid. Atlantic ..	+ 4.5	+ 7.5	+ 7.3
Cent. Ind.	+ 7.1	+ 9.2	+12.9
West Cent.	+ 7.6	+ 6.4	+10.5
Southeast	− 2.1	+ 0.5	+ 7.7
South Cent.	+ 9.1	+ 9.0	+12.2
Rocky Mount...	+14.5	+13.7	+ 9.9
Pacific			
NW	+14.6	+14.7	+12.5
SW	+13.6	+13.0	+ 7.7

Seasonally Adjusted Index 251.9

Week Ago 251.4 Year Ago 228.5

Source: Edison Electric Institute

Preview of this Issue

EVENTS ▶ **A-power plant progress and problems are in the spotlight again.** Congressional hearings include Elmer Lindseth's summary of broad industry-wide development that will cost over $540 million. Picture roundup shows how large-scale construction is coming along **(p 50)** . . . Union Electric's emergency restoration test was tried soon after its inception and found smooth-working in nearly all particulars **(p 53)** . . . FPC's staff's view of ECAP ad accounting draws fire from A. J. G. Priest, who explains how utility case differs from recent Supreme Court decision which squelched deductions for a beer wholesaler **(p 54)**.

ENGINEERING ▶ **A gas turbine can add economies to the steam-plant cycle** at a time when the usual cost-cutting procedures are bringing in shrinking returns. This week's cover story, by Worthington Corp Engineer I. J. Karassik, tells about resultant improved heat rate **(p 60)** . . . "Creep" in overhead conductors—its causes and problems—are the subjects of two stories, one by Alcoa's George Phillips, the other by Louisiana P&L's W. L. Rush, beginning on **page 56** . . . Save time and expense when building an A-power plant by constructing an exact scale model first. Atomic Power Development Associates did this for Detroit Ed's Enrico Fermi plant at Monroe, Mich. **(p 64)**.

Politics and Public Power

STILL ANOTHER UTILITY INVESTIGATION

Still another investigation of utility advertising practices has been proposed in Washington. This time it's a Congressional study into "the effectiveness of the Holding Company Act in dealing with monopoly abuses in the electric power field," proposed by General Manager Alex Radin of the American Public Power Assn.

In letters to members of both the Senate and House, Radin complained that the Electric Companies Advertising Program (ECAP) series is "reminiscent of the propaganda campaigns which were exposed in utility investigations by Congress and the Federal Trade Commission a quarter of a century ago." Radin charged it is "shocking to contemplate that this massive and costly assault upon the truth is being financed by the electric bills paid by millions of American consumers to private power monopolies," He singled out one advertisement as "completely contrary to fact."

The ad in question is titled, "When 'Public Power' Wins . . . You Lose." It pictures two hands clutching a number of coins. Radin hit various phrases in the ad. Examples:

- The ad says federal power promoters are trying to get their hands on more of your tax money. Radin countered with "Every cent invested in federal power projects is being repaid, with interest or equivalent."
- Ad claims $5½ billion spent on federal projects. Radin: It's closer to $3½ billion.
- Ad estimated another $10 billion is now being promoted for federal power. Radin: "Another Madison Avenue straw man."

But the importance of an investigation, such as Radin proposes, lies not so much in his attempted point-by-point rebuttals, but in

MANAGEMENT ▶ **Great Britain-vs-United States: How do their utilities stack up?** A comparison of operating data in the past decade shows that U. S. private utilities have improved more, both in efficiency and customer service, than the government-operated Central Electricity Authority of Great Britain. This is no reflection on CEA; there are too many differences in U.S. and U.K economies for that. Details, **p 99.**

MANUFACTURERS ▶ **Bigger, heavier electrical equipment means special railroad cars,** and manufacturers—GE, Westinghouse, Babcox & Wilcox, Combustion Engineering and Allis-Chalmers—all have their own. See **page 76** for a roundup of rolling equipment . . . A 20½-in. aluminum isolated phase bus, made by I-T-E Circuit Breaker Co, is slated to carry 12,000 amp, probably the largest carrying capacity in the world **(p 81).**

NEW EQUIPMENT ▶ **Dry-type transformer has low operating-noise level.** Rubber isolates core and coil from case . . . Switchgear for complete 480-v range is now available . . . Overpotential tester has a 120,000-v output **(p 86).**

SELLING ▶ **Five ceiling-type 15-kw heaters solve problem for shopping center** in Detroit. A large geodesic dome erected at the center can now be used for public events even in very cold weather **(p 96).**

the impetus it might lend two other current Washington developments.

The first of these developments is legislation proposed by Sen William Langer (R.-N. D.) and Rep Joe Evins (D.-Tenn.), to prohibit tax deductions on politically controversial ad contributions, and it could seal off any hope for utilities to deduct such ads as business expenses. A. J. G. Priest, counsel for most of the utilities in an ECAP ad accounting case before the FPC, has admitted that such legislation might knock down the utilities' major argument for handling the ad contributions as business expenses.

The bills by Langer and Evins are intended to reverse any ruling by the FPC or the Internal Revenue Service which might be favorable to the utilities in the ECAP cases now pending before them. IRS has held up action on an appeal by utilities on its 1958 ruling against an ECAP series, pending rulings by the U. S. Supreme Court in several related cases.

The Court's 9-to-0 ruling in these two cases, handed down two weeks ago, constitutes the second development. In Cammarano vs U. S. and Strauss vs Commissioner of Internal Revenue, liquor and beer wholesalers were prohibited from deducting their payments for ads which opposed initiative measures, submitted to state voters, to place their businesses under state control.

Although the Court rulings are a disappointment to ECAP contributors, Priest claims the issues are different. "Politically controversial," he says, means ads which attempt to influence specific elections or legislation. In this sense, the ECAP ads are not involved, he points out, because they are aimed only at the general education of the public. The Cammarano and Strauss cases, on the other hand, involved specific legislation.

Nuclear power is too expensive in both capital and operating costs. The most optimistic estimates of capital costs for large nuclear power plants range from $250 to $500 per kw, compared to $125 to $200 for conventional fuel-fired plants. **Advisory Committee on Reactor Policies and Programs, AEC.**

TECHNICAL NOTES

Economics of secondary capacitors revolve largely around the cost of distribution transformer capacity, yet indications are that methods used to determine this cost for capacitor applications vary widely.

Uranium consumption may be substantially reduced during operation of suitably designed low-enrichment uranium, light water reactors by "recycling" plutonium produced in the reactor.

Economic increases in capacity will justify the addition of a third conductor to a 420-kv line with two ACSR conductors of 592 mm^2 cross-section to permit use of any combination with series capacitors.

Polyethylene-insulated cables offer interesting possibilities for dc transmission applications. In spite of disadvantages, they can now be used up to 200 kv in deep-water submarine applications.

FROM EDITORS IN THE FIELD

Materials are classified and located in groups in Duke Power Co's new central warehouse to facilitate control and location of items. When material is re-ordered, the need for all associated items may be checked readily.

Poor operation of air conditioning blamed on unbalanced voltages was caused by incorrect connections of air conditioner controls, according to reports from the Southwest.

Generator cooling water discharge prevents ice formation at the cooling water intake screens at Bonneville Dam. A simple return pipe does the trick.

Underground 26-kv cables feed landscaped unit substations on the Seattle City Light system. Outgoing 4-kv feeders also are underground; thus, silhouettes are low and security fencing is unnecessary. Supply cable from pole-riser pothead to oil-immersed pothead is 1/c 34.5-kv shielded butyl-insulated cable.

THE PTL is excellent for estate type subdivisions, driveways, parks, hotel grounds, and recreation areas. The design lends the elegance of low, even lighting and the safety of good light with a minimum of glare. Subdividers and landscape architects will find the PTL well suited to their esthetic needs without sacrificing light efficiency.

New L-M Post Top Light Combines Appearance with High Efficiency

The new L-M PTL (Post Top Luminaire) combines decorative appearance with a highly efficient optical system. It is specially suitable for lighting driveways, residential and institutional grounds, schools, stores, subdivisions, parks, swimming pools, railway platforms, bus stations, and other places where the designer wants both good appearance and efficient light utilization.

Rigidly Built

The PTL combines a rigid spun-aluminum reflector, an efficient Holophane® refractor, and a sturdy aluminum mounting base. Reflector swings open on hinge for easy cleaning, and for replacement of lamps and ballasts.

Reflector and base in natural brushed aluminum, or choice of pastel colors. Available with small cadmium-sulphide photo control, which automatically turns light on at dusk and off at dawn.

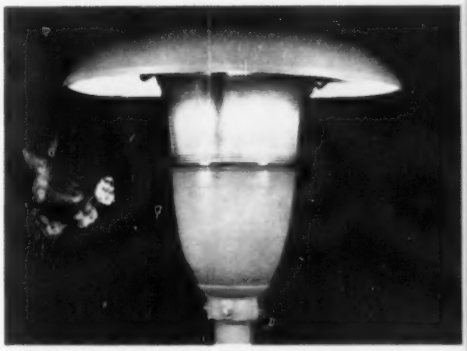
Choice of Five IES Patterns

For use with incandescent lamps up to 10,000 lumens, or 620 watts multiple; or with ballast in fixture for mercury vapor lamps up to 250 watts. Choice of five IES light patterns; types I, II, III, II 4-way, and V.

Two styles, for mounting on 3-inch or 7-inch poles. Tapered aluminum poles are available, to provide from 11- to 25-foot mounting heights.

Attractive Low Prices

Prices of the PTL luminaire start at $44; aluminum poles $46 and up. Mail the coupon below for free data sheets and details. Or contact any of the L-M offices listed on the other side.



THE NEW L-M PTL provides elegance of appearance and efficiently controlled light distribution. Available in brushed aluminum, or pastel colors, for 3- or 7-inch poles. For incandescent lamps, or with ballast for mercury vapor lamps. The PTL is also available with small photo control. Prices start at $44.

LINE MATERIAL® Industries
McGRAW-EDISON COMPANY

McGRAW EDISON

See Other Side

Outdoor Lighting

LINE MATERIAL INDUSTRIES,
Milwaukee 1, Wisconsin

- ☐ Please send me Bulletin 58203 on the PTL
- ☐ Also bulletins on other types of outdoor lighting

EW399

383

Name_____

Firm_____

Address_____

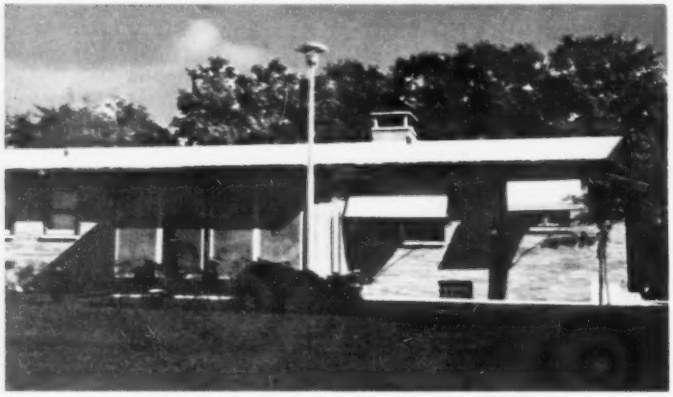
City_____ State_____

Please check: ☐ Architect
☐ Builder ☐ Consulting Engineer
☐ Utility Company
☐ Other_____

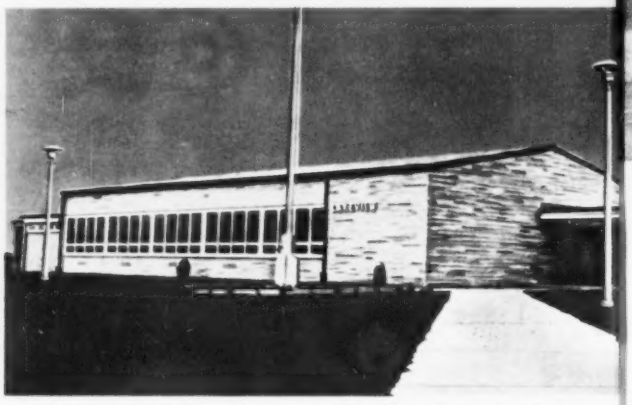
NEW L-M POST TOP LUMINAIRE

THE PTL is excellent for drive-ins, restaurants, hotels, motels, store fronts, shopping centers, water-front areas, railway stations, and many other applications.

Either incandescent or mercury lamps may be used. When the PTL is used for mercury vapor, the ballast is mounted in the fixture where it is easily accessible.



FOR INSTITUTIONAL OR RESIDENTIAL ground lighting, the PTL offers fine appearance, with efficiency. It spreads a soft, uniform light over a large area, with minimum glare.



NEW SCHOOL—NEW LIGHTING! L-M Post Top Luminaires add beauty to the facade, and provide excellent decorative and safety lighting for the area around the building.

. . . **AND NOW.** Conversion of this old light standard with a new PTL is more in keeping with the modern appearance of the building of the Bank of Naperville, Ill. The PTL will modernize most existing upright standards by direct replacement at a cost comparable to the replacement of two old-fashioned ornamental glass globe and canopy combinations.

For detailed specifications, mail the coupon on other side— or phone or write any of these

SALES OFFICES

Albany 4, N.Y.	966 Broadway
Albuquerque, N.M.	1312 Mesilla, N.E.
Allentown, Pa.	2405 Fairview St.
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East Stroudsburg, Pa.	North Burson St.
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Melrose Park, Ill.	4700 Lake St.
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Moorhead, Minn.	918 So. First St.
Murrysville, Pa.	P.O. Box 297
Nashville 4, Tenn.	1503 Laurel St.
Newington, Conn.	54 Pane Rd.
New Orleans 22, La.	2860 Arts St.
New York 6, N.Y.	74 Trinity Pl.
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Oklahoma City 5, Okla.	317 N. E. Hill St.
Omaha 3, Neb.	3415 Cuming St.
Philadelphia 2, Pa.	Broad & S. Penn Sq.
Phoenix, Ariz.	625 W. Madison St.
Pine Bluff, Ark.	1904 W. 31st St.
Portland 9, Ore.	1333 N. W. 12th Ave.
Raleigh, N.C.	216 Russ St.
Revere, Mass.	570 Revere Beach Parkway
Richmond 20, Va.	4111 W. Clay St.
Roanoke, Va.	915 S. Jefferson St.
Sacramento 18, Calif.	1123 Teneighth Way
St. Louis 1, Mo.	706 Chestnut St.
Salt Lake City 10, Utah	980 S. 6th West St.
San Antonio, Texas	1512 Majestic Bldg.
Seattle 99, Wash.	1220 W. Nickerson St.
Sioux City, Iowa	3606 Court St.
So. San Francisco, Calif.	360 Shaw Road
Spokane 24, Wash.	E. 3303 Ferry St.
Springfield, Ill.	Illinois Bldg.
Springfield, Mo.	961 S. Weller
Syracuse 2, N.Y.	221 Erie Blvd. W.
Tampa 2, Florida	306 No. Newport Ave.
Topeka, Kan.	1428 Belle Ave.
Union, N. J.	Iorio Industrial Park
Wichita, Kan.	1400 N. Charles
Zanesville, Ohio	Pershing Road

In Canada: Canadian Line Materials, Ltd., Toronto 13, Ontario

North and south business sections of Mishawaka, Ind., are lighted by 94 L-M V-type fluorescent units (188 luminaires), mounted on 30-foot aluminum poles which are staggered at 70-foot spacing. Each of the two 4-foot luminaires in the V has two 100-watt lamps, providing approximately 24,000 lumens per pole. Units were supplied by Englewood Electric Supply of South Bend. Installation was by the Mishawaka Electric Department under the direction of Superintendent Austin R. Klien, with the cooperation of L-M's Field Engineer C. W. Puent. Note the even, diffused lighting.

L-M V-Type Fluorescents Turn Night Into Day At Mishawaka

The L-M V-type luminaires used in Mishawaka and many other cities in the country are an outstanding development in outdoor lighting equipment. These V-type units consist of two luminaires mounted at a 45-degree angle to each other. Each luminaire contains two 4-foot 100-watt fluorescent lamps. This gives maximum utilization of the light output.

The design of the luminaires, plus the 30-foot mounting height and 70-foot staggered spacing, results in exceptionally even light distribution.

Referring to the installation, Mayor Albert L. Doyle said: "The installation of our revolutionary fluorescent lighting system is heralded by enthusiastic and universal acclaim by all of our citizens and, most particularly, by our merchants, who honestly feel that a long-awaited improvement has been most satisfactorily completed."

What Do You Want To Light?

Tell us your problem; L-M lighting engineers will help you solve it—whether it's a street, a parking area, a subdivision, or an airport. L-M makes equipment for all, and L-M engineers will design the system you need, and provide complete plans and a bill of materials. For information and bulletins, ask the L-M Field Engineer or Lighting Engineer in your area; or write Lighting Division, Line Material Industries, Milwaukee 1, Wisconsin. In Canada: Canadian Line Materials, Ltd., Toronto 13, Ontario.

V-type fluorescent

Shallow design, for wide spread

Deep design, for more concentrated light

Delta type, for parking areas, shopping centers

Floodlight type, for parallel lighting

376

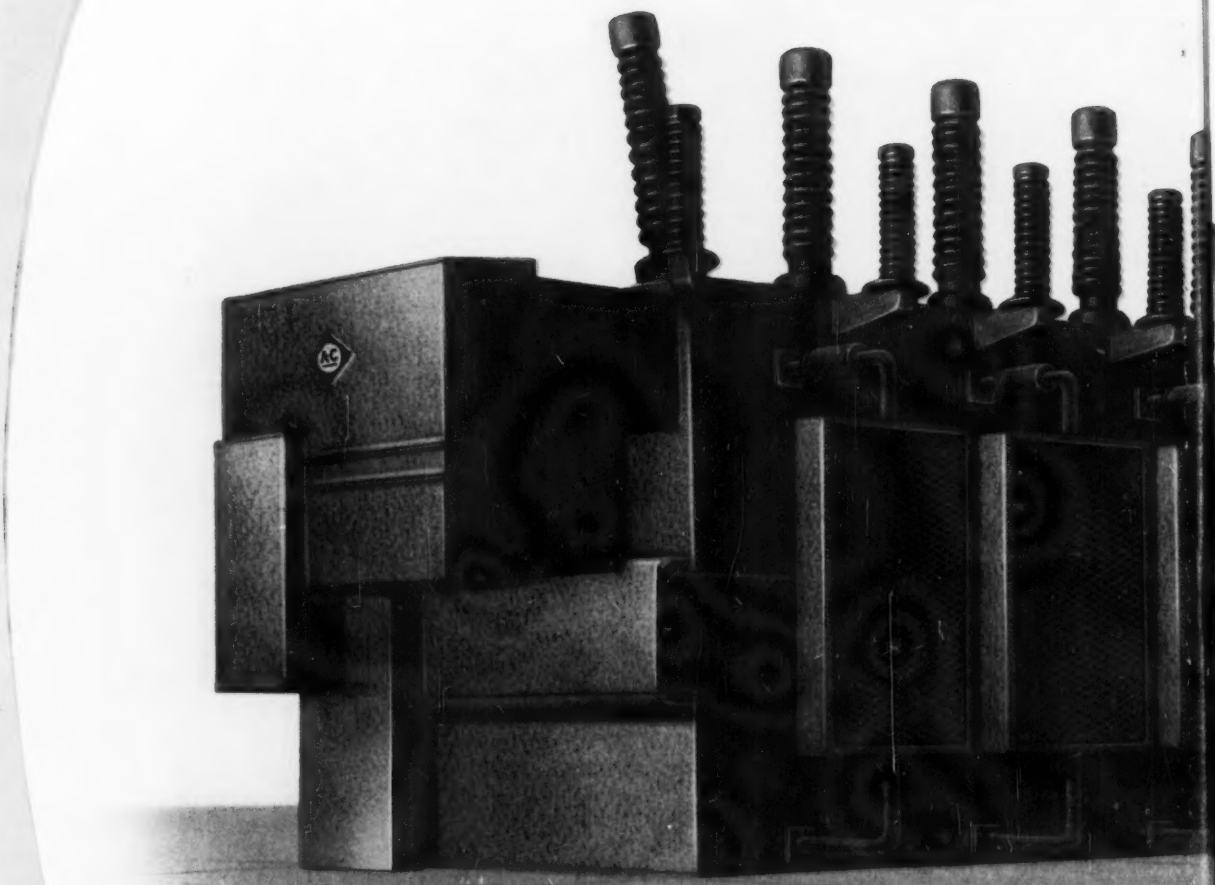
LINE MATERIAL Industries

McGRAW-EDISON COMPANY

Outdoor Lighting

McGRAW EDISON

Another example of



A-5865

Allis-Chalmers leadership in transformers

404,250-kva Transformer for Crawford Station

A LARGE three-phase transformer — perhaps the largest — was recently ordered by Commonwealth Edison Company for delivery to Crawford Station in 1960.

The transformer is designed to fit the limited space available between two buildings at Crawford Station. It will also be sized to permit shipment as a complete unit with only bushings and *Electro-Coolers* removed for shipping.

This transformer will weigh about 660,000 pounds and have an equivalent two-winding capacity of 404,250 kva.

Rating of the low voltage winding is 385,000 kva at 12,600 volts. Its two high voltage windings are each rated 211,750 kva and will feed two 138-kva systems. Plus or minus 10 percent load tap changers will be provided for each high voltage winding.

The trend to modernization of power stations is being accelerated by the economies of these larger transformers, as well as bigger generating units.

For further information about the design, building and testing of Allis-Chalmers power transformers, call your nearby A-C office, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

Electro-Coolers is an Allis-Chalmers trademark.

ALLIS-CHALMERS

Safe performance

of 4 operations in proper sequence assured by KEARNEY *REGULATOR BY-PASS* DISCONNECT

KEARNEY Regulator By-Pass Disconnects in a 15,000 volt, 3 phase, open delta regulator installation.

- **no danger of accidentally dropping load**
- **no hazard from interrupting exciting current**

With the same motion—in the same time—required to open *one* conventional disconnect, the KEARNEY Regulator By-Pass Disconnect:

shunts the line leads to by-pass the regulator—opens both leads to the series winding—safely interrupts the exciting current.

What's more, you realize substantial savings in cost of switches, installation time, supporting structure and leads, because *only one* KEARNEY By-Pass Disconnect is needed for each phase of a regulator installation, compared to *three* single-throw disconnects. And the operator has *maximum safety*, since all switches can be located on the same side . . . visible from one point!

JAMES R. KEARNEY CORPORATION, *General Offices:* 4224-42 Clayton Avenue, St. Louis 10, Missouri

for BETTER CONSTRUCTION
SAFER MAINTENANCE
Specify KEARNEY
JAMES R. KEARNEY CORPORATION ST. LOUIS, MO. GUELPH, ONT.
The Mark of Quality PRODUCTS

Plants at: ST. LOUIS • FAYETTEVILLE, ARK. • SHENANDOAH & CLARINDA, IOWA—GUELPH, ONT., CANADA

DEAD END WITH

BLACKBURN

W6-2A from 6 Sol to 2 ACSR
This Clamp Will Handle All Popular Service Drop Wires

WEDGE CLAMPS

For Light Service
W6-4A
6 Sol to 4 ACSR

For Heavy Service
W2-OA
2 Sol to 1/0 ACSR

Conductor in contact with wedge for entire length of slider.

Removable aluminum slider allows installation without threading through clamp.

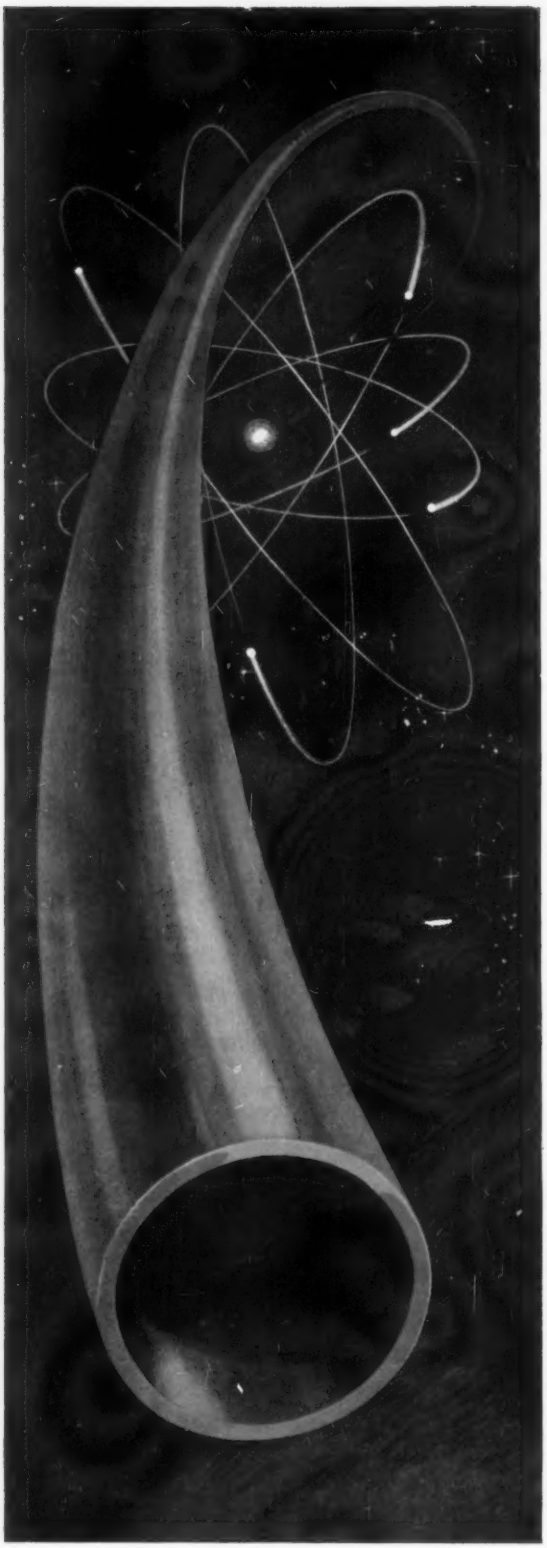
Drop wire can be pre-sagged and cut to exact length needed.

Can be attached to bare neutral at any point in the span.

Your Choice of 3 Bails

STANDARD **FLEXIBLE CAPTURED** **FLEXIBLE FREE**

JASPER BLACKBURN CORPORATION 1525 Woodson Rd., St. Louis 14, Mo., WYdown 3-9430.



If you need condenser and heat exchanger tubes for critical service...

Specify **Phelps Dodge**... a major supplier for nuclear projects!

Phelps Dodge condenser and heat exchanger tubes are currently in use in nuclear energy applications where highest quality and exacting specifications are essential.

Every Phelps Dodge tube intended for use in a nuclear project undergoes a series of severe tests to assure rigid conformance to the required specifications and ability to perform under the rigorous service conditions found in this highly specialized field. Testing facilities used by Phelps Dodge cover not only standard ASTM specifications but also include these special non-destructive tests:

- Eddy-current inspection
- Dye penetrant test
- Ultrasonic inspection

To keep pace with the steadily growing importance of the nuclear power field, Phelps Dodge will soon open one of the largest tube mills in the world at South Brunswick, N. J. This mill will have the most modern automatic tube fabricating machinery, the finest research laboratories and the most advanced testing equipment.

Inquiries regarding your condenser and heat exchanger tube needs, particularly those requiring Electronic and Penetrant Tests, are invited.

PHELPS DODGE COPPER PRODUCTS CORPORATION
300 PARK AVENUE, NEW YORK 22, N. Y.

PD

new symmetrical interrupting ratings for XS Cutouts adjust lab results to field conditions

S&C matches actual ratings to system short-circuit calculations—

To simplify application, S&C has now provided symmetrical ratings for its distribution cutouts.

These new symmetrical ratings are provided because asymmetrical ratings are based on total available short-circuit current of the circuit, including the DC component. The asymmetrical ratings furnish a uniform, standardized measure of cutout performance, but they cannot, of course, be used directly in matching cutouts to system short-circuit calculations which yield *symmetrical* values.

The new symmetrical ratings bridge the gap and eliminate the possibility of "underprotecting" the system with a cutout of inadequate interrupting capacity, or "overprotecting" with a cutout of unnecessarily high interrupting capacity.

To arrive at a nominal set of symmetrical ratings, specific X/R ratios are assumed for the Heavy Duty XS and the Extra Heavy Duty XS,—8 and 12 respectively—typical of the conditions at locations where each of these cutouts is applied (see table at right).

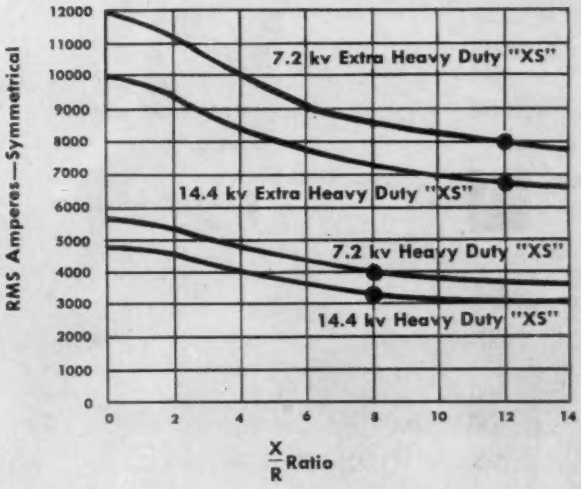
To enable the distribution engineer to take advantage of more favorable conditions—that is, where the X/R may be lower—special adjustment curves (shown to the right) are provided. These curves indicate the symmetrical interrupting ratings of the XS at other X/R ratios. (Those at 0 are the *actual* asymmetrical interrupting capacities of the XS, which may differ from the *nominal* asymmetrical ratings per NEMA standards.)

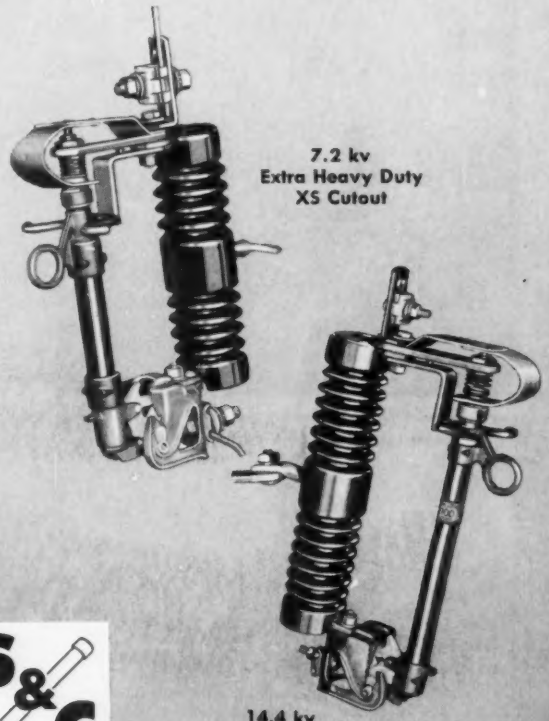
For further information, write for Descriptive Bulletin 511—providing full data on the XS Cutout—to S&C Electric Company, 4421 Ravenswood Ave., Chicago 40, Ill. In Canada: S&C Electric Canada, Ltd., 8 Vansco Road, Toronto 14, Ontario.

50/60 Cycle Short-Circuit "Nominal" Interrupting Ratings

Nominal Ratings kv	Amperes, RMS			
	Heavy Duty "XS"		Extra Heavy Duty "XS"	
	Asymmetrical	Symmetrical	Asymmetrical	Symmetrical
7.2	5000	4000	12000	8000
14.4	4000	3300	10000	6700

Adjustment Curves for Symmetrical Interrupting Ratings of XS Cutouts at various X/R Ratios.





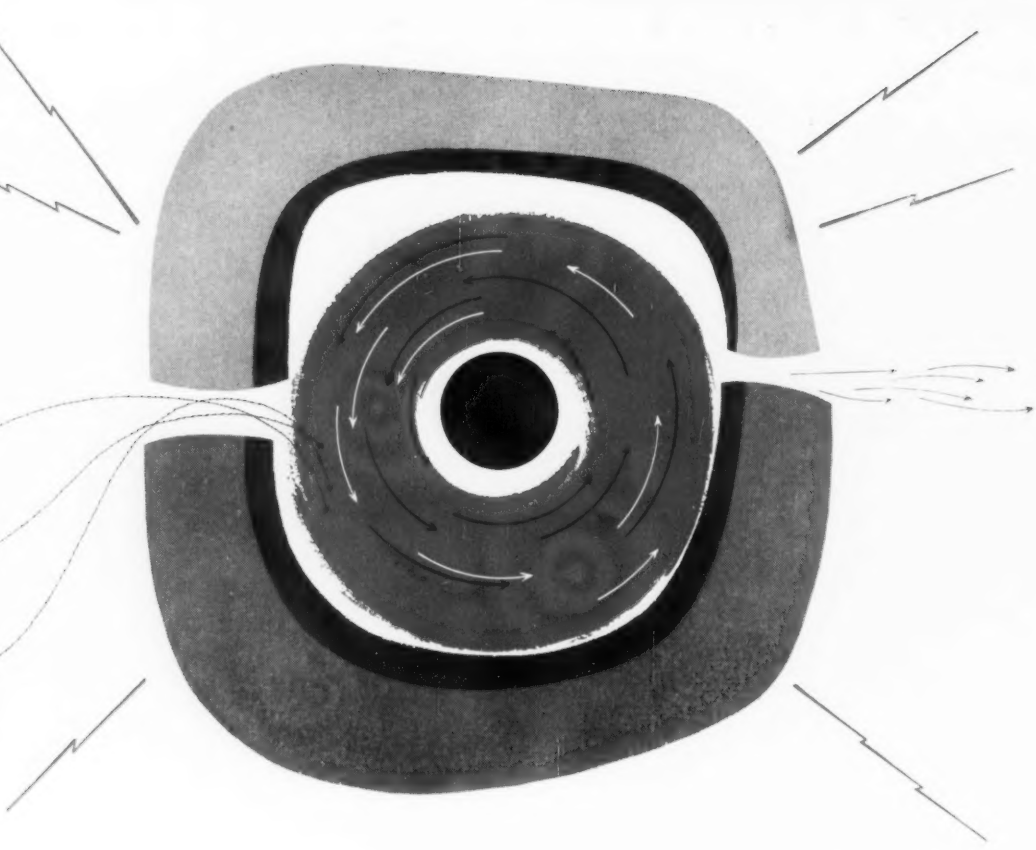
7.2 kv Extra Heavy Duty XS Cutout

14.4 kv Heavy Duty XS Cutout

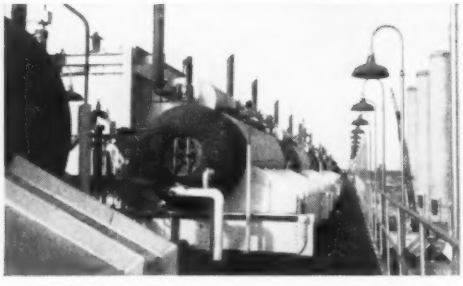
S&C ELECTRIC COMPANY

Power Fuses · Tool-Operated Disconnects · Open and Enclosed Cutouts · Load Interrupters · Metalclad Switchgear · "Loadbuster"

INGENUITY



has made KE a major builder of power facilities



A 475,000 KW power generating facility, engineered and built by KE.

Faster construction, more efficient operation, lower costs—these are benefits Kaiser Engineers' ingenuity has brought to power projects ranging from America's largest dam to power installations for industrial plants.

Experienced KE engineers can take your power idea from a gleam in your eye through start-up—from economic analysis through operator training.

Whether your future power needs are thermal or nuclear, call KE. Let KE's ingenuity produce real time and money savings for you.

KAISER ENGINEERS engineers—contractors
Contracting since 1914

Division of Henry J. Kaiser Company • Oakland 12, California • New York, Pittsburgh, Washington, D.C., Buenos Aires, Calcutta, Dusseldorf, Montreal, Rio de Janeiro, Sydney, Tokyo

You gain extra clearance two ways

It's quite possible that the extra 12 inches of pole-top clearance you get from using Varex capacitors could mean the difference between using the existing pole and paying for either a pole extension or a completely new pole.

Then there's the saving in installation time. To get the clearance for moving capacitors under the primary and into the rack it's often necessary to move the primary with hot sticks. By using Varex units you may avoid this problem.

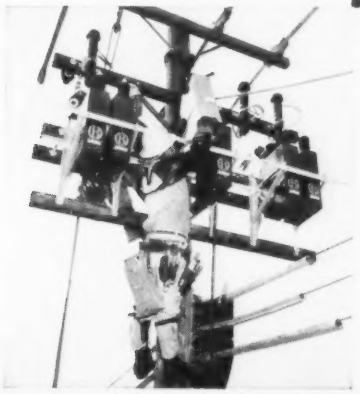
You get extra clearance from the Varex design in two ways. Varex 50-KVAR units are as much as five inches lower than other brands. Another six to eight inches of clearance is gained by the central location of the lifting eye between the bushings. Your hook, shackle, or clevis can go right down between the bushings without any space-consuming sling arrangement.

This is just one example of the way Varex designers have kept you, the user of capacitors, foremost in mind. It's another good reason for making sure Varex capacitors are on your standards list.

OHIO BRASS COMPANY, MANSFIELD, OHIO

Low height, central lifting eye make VAREX capacitors easy to install at pole top

Hook goes down between bushings; no sling arrangement needed.



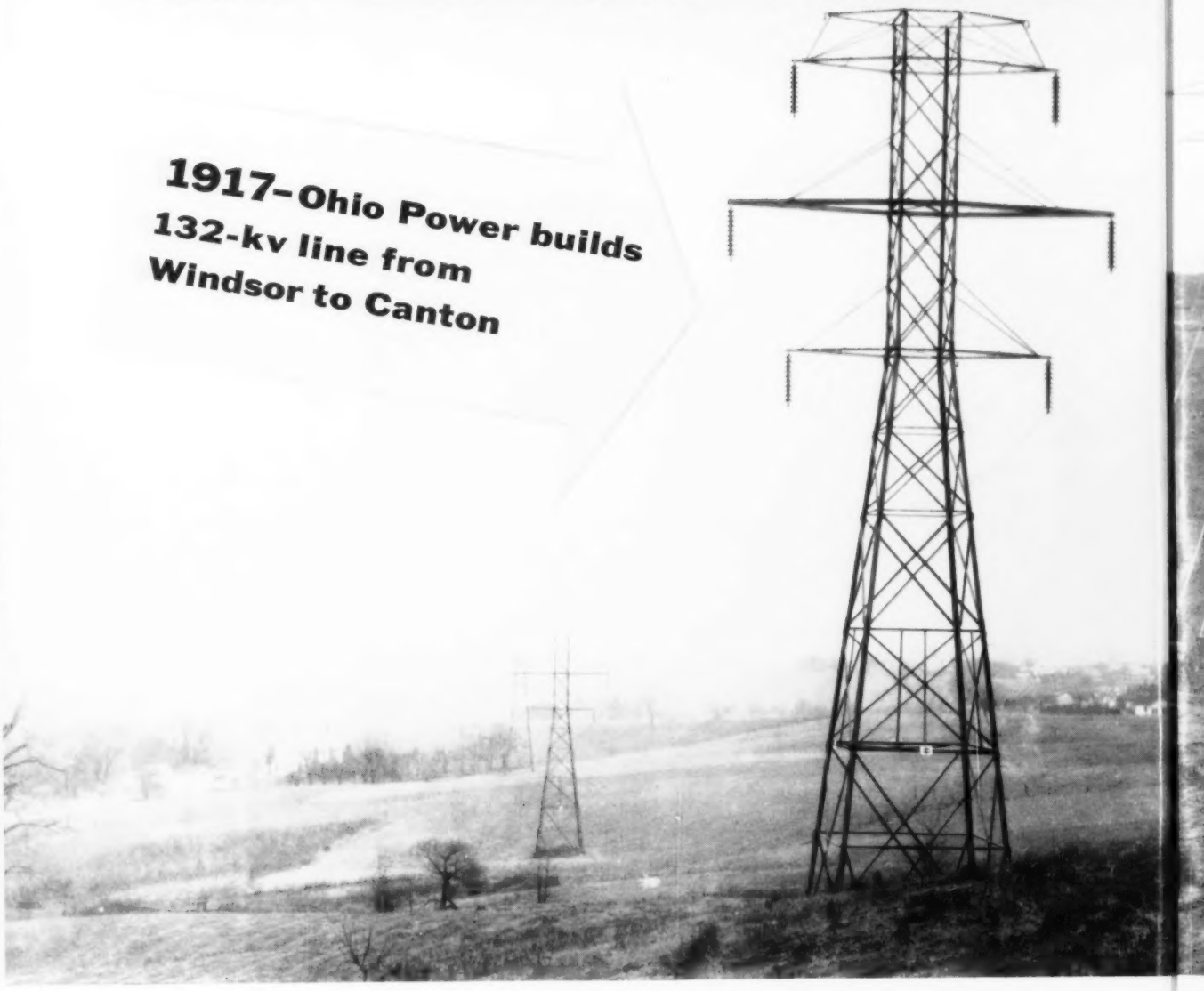
Low over-all Varex height provides extra clearance at poletop.

Ohio Brass

HOLAN

PORCELAIN INSULATORS • LINE HARDWARE • CAPACITORS • LIGHTNING ARRESTERS
BUSHINGS • HOLAN TRUCK MOUNTED POWER DEVICES AND BODIES • BRONZE VALVES

When Ohio Power makes EHV



1917–Ohio Power builds 132-kv line from Windsor to Canton

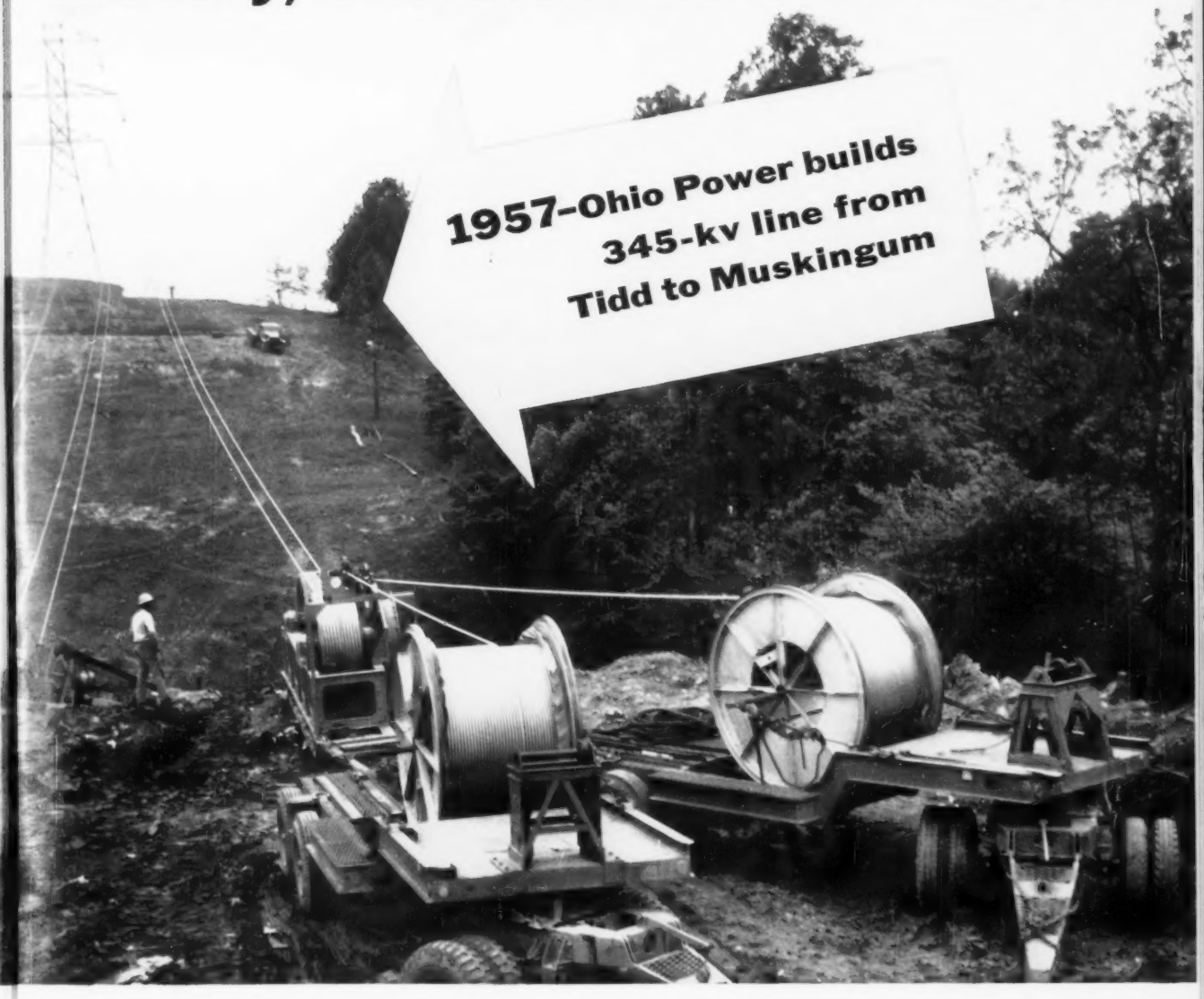
First major step in the integration of the American Electric Power System (then American Gas and Electric) occurred in 1917, in the territory of what is now the Ohio Power Company.

The modern 30,000-kw Windsor steam plant had just been built on the Ohio River near Wheeling. The plant was 55 miles from its load center at Canton, Ohio. Here was the foundation for an integrated system, with generation located for maximum efficiency, tied together by high-voltage transmission lines.

132-kv transmission was an extra-high voltage in its day. Success of the Windsor-Canton line quickly led to more 132-kv transmission in both Ohio Power and sister AEP companies. By 1929, the 132-kv network permitted two-way power exchange throughout the area from Lake Michigan to the border of North Carolina.

Now American Electric Power has 1,200 miles of 345-kv transmission line, today's

history, O-B Insulators are there!



EHV. The latest 345-kv addition to the Ohio Power system is the 84-mile line linking the Tidd plant on the Ohio River with the Muskingum plant on the Muskingum River. More than 16 miles of the 84-mile line have bundled conductors strung under tension.

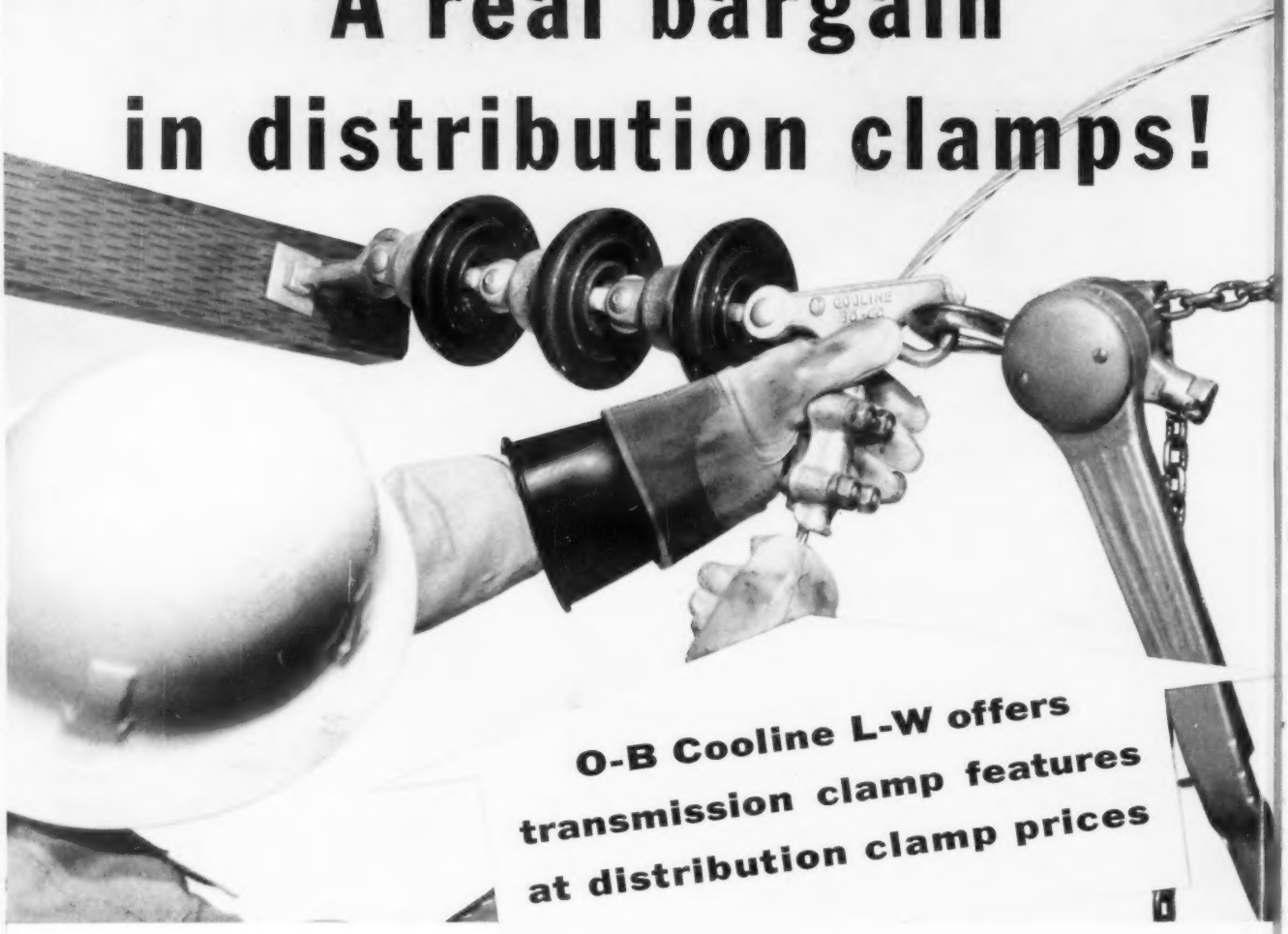
O-B insulators were used on the Windsor-Canton line. They are in service on the new Tidd-Muskingum line. When EHV history is being made, O-B insulators have a habit of being there!

Ohio Brass (B)

HOLAN

PORCELAIN INSULATORS · LINE HARDWARE · CAPACITORS · LIGHTNING ARRESTERS
BUSHINGS · HOLAN TRUCK MOUNTED POWER DEVICES AND BODIES · BRONZE VALVES

A real bargain in distribution clamps!



O-B Cooline L-W offers transmission clamp features at distribution clamp prices

You can build transmission-grade construction into distribution deadends when you use the low-cost, aluminum Cooline L-W clamp.

The O-B Cooline L-W is especially designed for the distribution trend to larger conductors and shorter spans, but it offers many of the advantages of the heavy-duty Cooline series for transmission lines. The L-W has:

Excellent Holding Strength -- More than adequate for distribution deadends -- 10,000 pounds for two U-bolt clamps, 15,000 pounds for three U-bolt model.

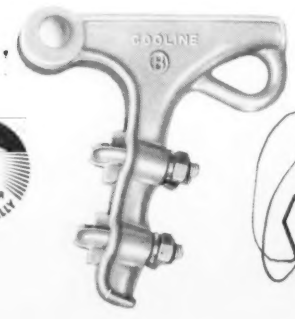
Aluminum Construction -- Minimizes electric losses and conductor heating.

No Need to Cut Conductor -- Conductor can be strung in continuous loop without cutting or splicing. It automatically comes off at the proper angle for making the jumper loop.

Protection for Conductor -- Wavy seat of clamp and special contour of captive keepers develop firm holding action without crushing conductor.

Wide range of conductor sizes (.20 to 1.3 inches diameter), light weight, standard packaging for easy handling and inventory, and simple installation are among the many benefits of this versatile clamp.

You get all this in the Cooline L-W at a price that will surprise you -- pleasantly. Check the L-W and you'll find it's today's real bargain in distribution deadend clamps.



OHIO BRASS COMPANY, MANSFIELD, OHIO

Ohio Brass HOLAN

PORCELAIN INSULATORS • LINE HARDWARE • CAPACITORS • LIGHTNING ARRESTERS
BUSHINGS • HOLAN TRUCK MOUNTED POWER DEVICES AND BODIES • BRONZE VALVES

4976-H

Dravo builds world's largest coal unloading tower at Memphis

New "Siamese twin" unloader serves 812,500-kw power plant

The world's largest coal unloading tower, designed and built by Dravo, is now serving the new 812,500-kw capacity Thos. H. Allen Generating Station at Memphis, Tenn.

This is the largest steam power plant ever authorized at one time by any municipality and was designed by Burns and Roe, Inc., of New York City, who also supervised plant construction.

Dubbed "the Siamese twins," the new unloader consists of two towers on a single base. Each of the two unloading units operates a 13.3-ton capacity bucket, with individual adjustable voltage control.

This unloader has a digging capacity of 2600 tons of coal an hour — 1300 tons per unit.

Separate welded, triangular booms are provided for each bucket trolley. Integrated design of the booms, with compression members into the tower, results in a structure of low height — 126 feet.

Find out more about how Dravo design and building know-how can help solve your coal or ship unloading problems. Contact DRAVO CORPORATION, Pittsburgh 25, Pennsylvania.

DRAVO
CORPORATION

USS Tiger Brand Electrical Wire & Cable

A standard cable for every special job

- Asbestos Wire and Cable
- Mold Cured Portable Cord
- Shovel & Dredge Cable
- Paper & Lead Cable
- Varnished Cambric Cable
- Interlocked Armor Cable
- Special Purpose Wire & Cable
- Aerial, Underground and Submarine Cable

Cuts time and cost of highway lighting...

Tiger Brand Type RR Cable

Are you or your customers in on any highway lighting jobs?

It could be a good source of business. Even at the local level, it is big!

With the new 41,000-mile Federal Highway Program rolling along . . . and many additional miles of thruways and boulevards planned or under construction, the lighting of intersections and service areas is a challenging opportunity for alert electrical contractors and suppliers.

American Steel & Wire makes a cable that's especially designed for underground installation. Known as Tiger Brand Type RR Cable, it meets all requirements for outdoor lighting installations. Sheathed with an outer jacket of tough, resilient Neoprene, Type RR Cable can be buried directly in the soil, thus eliminating the necessity for ducts, conduits and other external protection. It is light in weight, easy to handle and more economical to install.

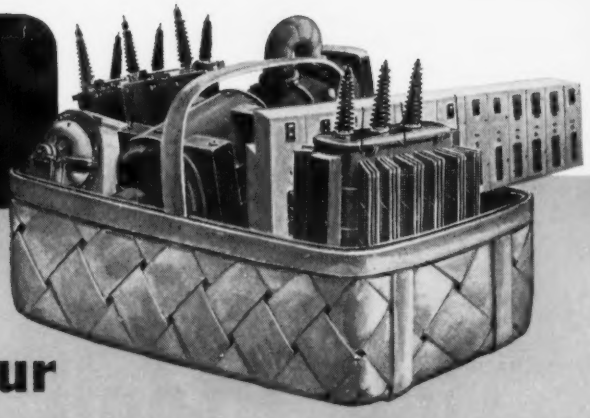
For further information about Type RR Cable and other Tiger Brand electrical wires and cables, get in touch with our nearest sales office, or write direct to American Steel & Wire, 614 Superior Ave., N.W., Cleveland 13, Ohio.

USS and Tiger Brand are registered trademarks

American Steel & Wire Division of USS **United States Steel**

Columbia-Geneva Steel Division, San Francisco, Pacific Coast Distributors • Tennessee Coal & Iron Division, Fairfield, Ala., Southern Distributors
United States Steel Export Company, Distributors Abroad

Is it wise to buy your Auxiliary Motors by the "Market-Basket" system?



It pays to get your AUXILIARY MOTORS from the people who build them best!

CONSIDER THIS before you select your important auxiliaries—*who builds the best powerhouse motors?* . . . who has a solid reputation of thoroughly proving their motors before offering them to buyers?

Ask your engineers and operating men. They are thoroughly familiar with design and construction features that provide long life and trouble-free operation. Ask them if "market-basket" buying provides the *best* units . . . if "unified responsibility" guarantees the *best* auxiliary drives.

Elliott introduced the first *really* outdoor motor which subsequently led to an entirely new NEMA classification—the "weather-protected" motor. Elliott was first to produce "super-quiet" large motors and functional Fabri-Steel frames. Elliott has persistently utilized new insulation materials and fabrication methods which have achieved astonishing records of 20, 30, and 40 years of service. Elliott built the first large 2-pole motor in 1916, has consistently led in their development, and has built the largest ever constructed.

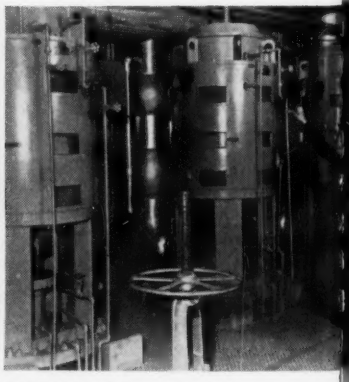
Elliott's unmatched product quality and performance is due to unremitting research for better materials and designs . . . thorough testing of all equipment and components before placing them on the market . . . modern facilities and equipment . . . many years of engineering and manufacturing "know-how" and craftsmanship born of experience.

There's simply no substitute for the benefits which you receive from Elliott's superior design and good workmanship . . . and that's why it pays to do business with Elliott.

ELLIOTT Company
RIDGWAY PLANT • RIDGWAY, PA.

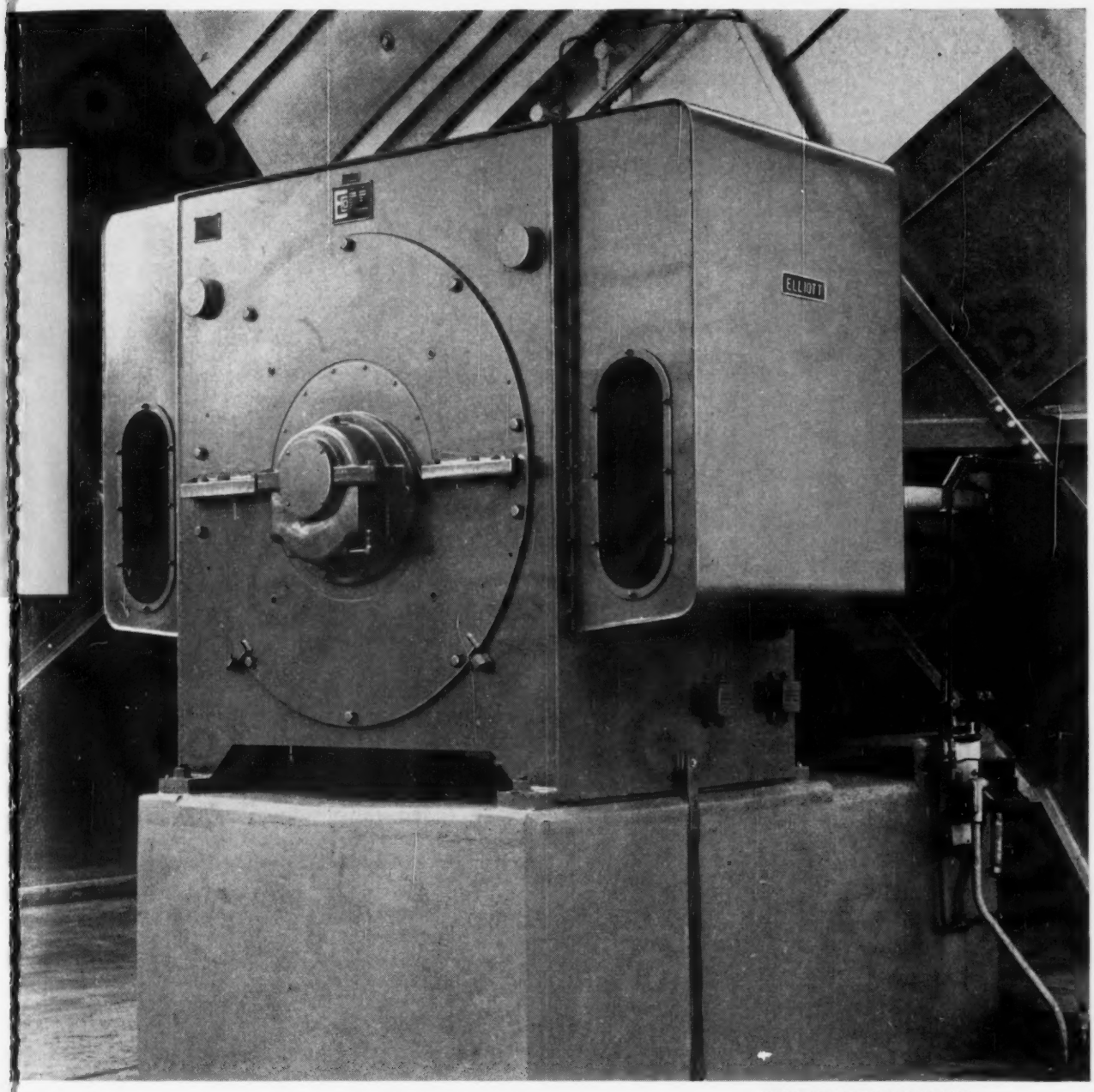
Specialists in large motors for over 50 years. Here are typical examples.

CIRCULATING-WATER PUMP MOTOR

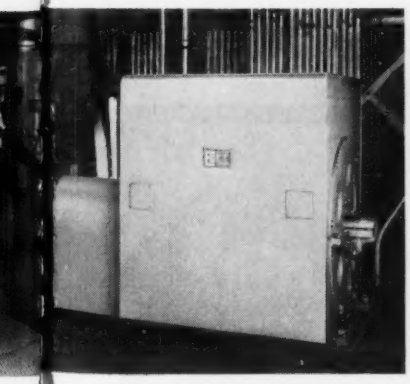


CONDENSATE PUMP MOTOR

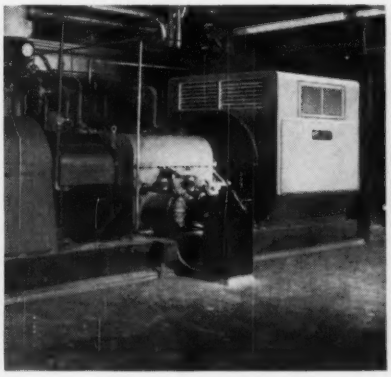
R9-3



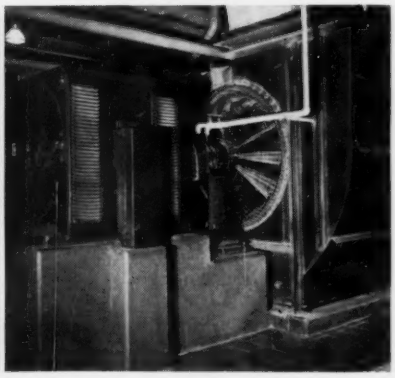
INDUCED-DRAFT FAN MOTOR



PULVERIZER DRIVE MOTOR



BOILER-FEED PUMP MOTOR



FORCED-DRAFT FAN MOTOR

LAPP DISTRIBUTION POSTS

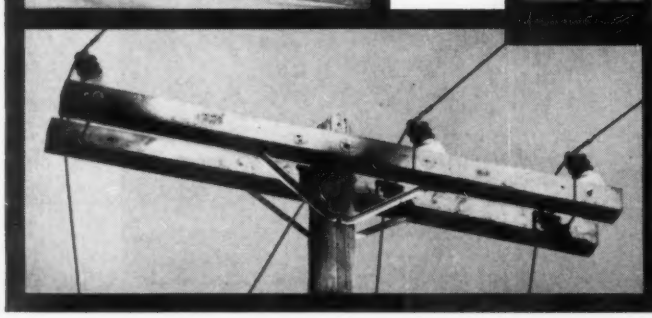
Line Post reliability for distribution lines up to 27 kv

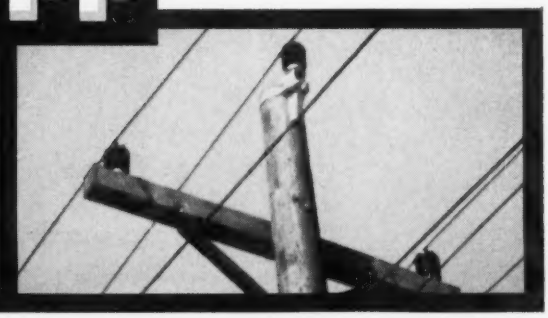
No distribution line you can build will serve as dependably, save as much sleep for your maintenance crews, or build as much customer good-will, as the one you put on Lapp Distribution Posts. These trim-appearing "junior Line Posts" just won't puncture . . . their solid one-piece porcelain body separates conductor from ground for its full length. Won't crack either . . . the only metal-to-porcelain joint is at the base; loading of porcelain is only in large-area, low-intensity compression. Greatly more resistance to flashover and impact, too . . . has short super-sturdy petticoats, with extra protection against failure in the fact that when petticoats are broken away, the post body remains intact with almost its full insulating values. Completely free of radio- or TV-interference at any operating voltage. Fog-type for superior performance in dust or atmospheric contamination.

Where else can you get so much for so little cost? Better look into it.

Lapp Insulator Co., Inc., Le Roy, New York.

Lapp





No. 12 in a series

Right off the Wire

1. A new teletypewriter can print 3,000 words a minute and has a theoretical top speed of 500,000.

2. Work has begun on a pilot model of a device for generating electricity from the controlled fusion of hydrogen at a temperature of about one hundred million degrees.

3. A new industrial pump has a piston that moves only a fraction of an inch, but at the rate of sixty cycles per second. It has no outside openings and cannot leak.

4. The "world's first" atomic house heating installation is being built underground in a suburb of Stockholm.

5. "Hydrogasification" is a one-step process that produces gas directly from oil shale with an efficiency of over ninety per cent.

6. A radar target made for small boats reduces the risk of their being run down by large vessels and also makes it easier for them to be found when in distress.

7. Heat radiation in amounts as small as one-twentieth of a billionth of a watt can be detected by a new instrument.

8. A traffic signal on wheels is battery operated and can be set up anywhere.

9. Tire treads made of a new synthetic rubber are said to be forty percent more durable than those made of natural rubber.

10. Power is transmitted to two of the world's largest coal-digging machines through 3 conductor, 7500-volt, Simplex TIREX shovel cables.

11. One hundred and twenty-five skilled workers will be replaced by a new automatic tester for transistors which will also make fewer errors.

12. A new metal-working plant will be air-tight and metals will be fabricated at high temperatures in an atmosphere of argon.

13. A three-dimensional mobile radar shows the direction, distance and height of aircraft.

14. A battery charger for outboard motors uses the generator of the towing car while the boat is on the trailer.

15. Earphones that cancel outside noises by creating neutralizing sound waves are being used experimentally by the Army.

Further information on these news items and on Simplex cable is available from any Simplex office. Please be specific in your requests.

16. Homes may be lighted, heated and cooled electrically by means of a type of panel now being developed.

17. A reading aid for the blind translates each printed letter into a different musical note.

18. An underground hospital is to be built which will have 650 beds. It is to be completed in 1960.

19. Molten sulphur will be pumped up from a depth of 2,000 feet under the floor of the Gulf of Mexico. The installation is being made seven miles off the Louisiana coast and the liquid will be pumped to shore for refining.

20. New gallery-type railroad passenger coaches and parlor cars are being used for medium-haul service. The bi-level streamliners, designed for high capacity and low weight per seat, use Simplex Car Wire throughout.

21. Growing under artificial sunlight, a new strain of algae multiplies a thousandfold in a day.

22. Fungi may have been the first living space travelers. It has been found that some spores can exist in a vacuum equal to that in interplanetary space.

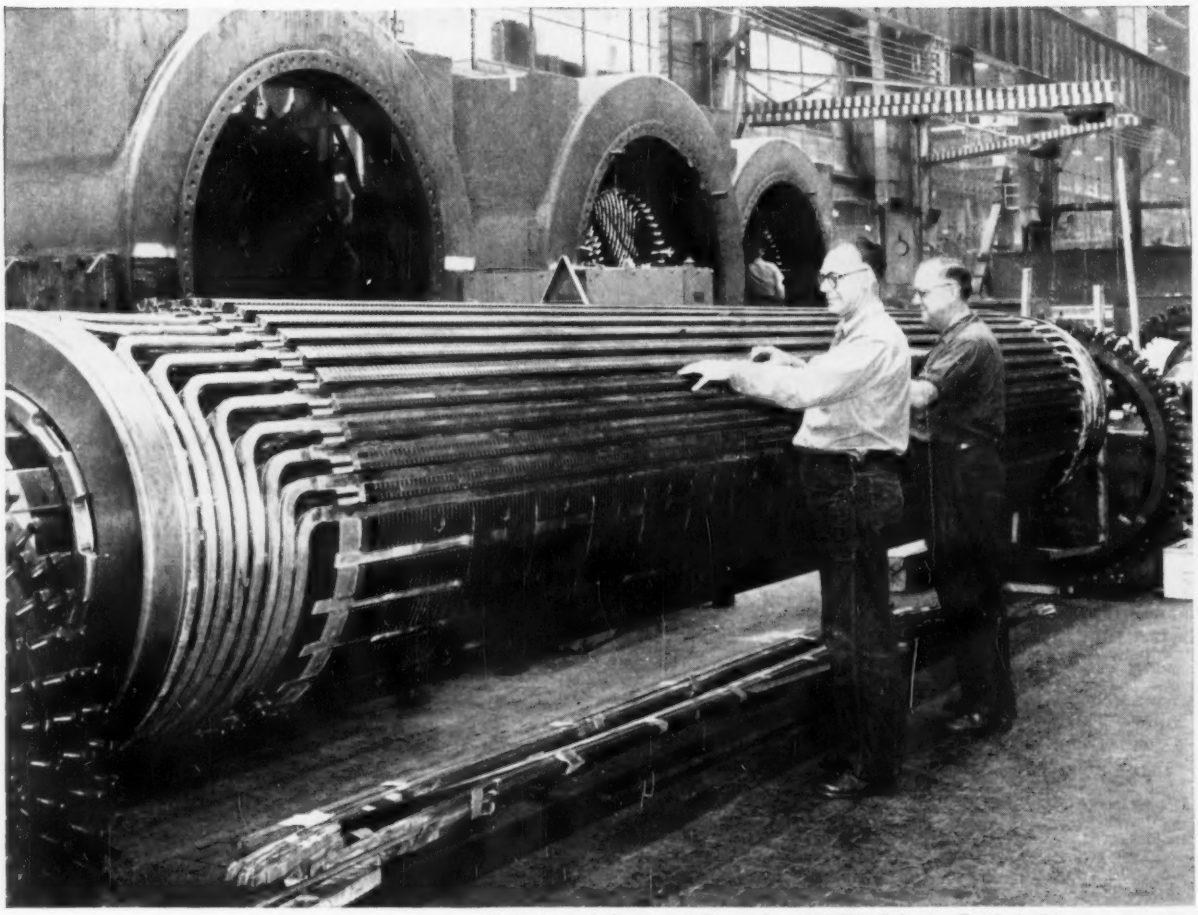
Transatlantic Concert

One of the most notable musical events of all time took place recently at the United Nations building in New York. The concert, featuring the Boston Symphony Orchestra and distinguished musicians from Paris and Geneva, was highlighted by the performance of Pablo Casals, world-famed violin-cellist. This epochal musical treat was telephoned to seventy-five countries by the Bell System, over the transatlantic submarine cable, the American portion of which was made by Simplex.

SIMPLEX WIRE & CABLE CO.
Cambridge, Massachusetts and
Newington, New Hampshire

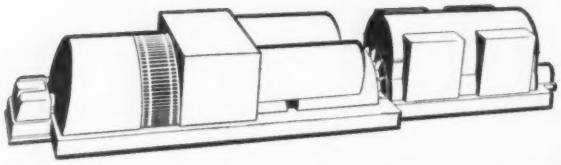
Simplex

Highest quality cables for: Mining
Power & Lighting • Construction
Transportation • Communications
Signalling



Generator winders insert filler strips of "K&M" Asbestos Textile in this generator rotor built by General Electric Company for use in a 175,000-kw turbine-generator unit.

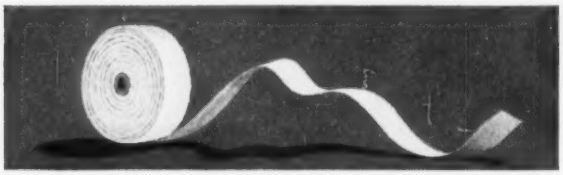
K&M ASBESTOS TEXTILES provide armor for large powermakers



This 175,000-kw General Electric steam turbine-generator is powerful enough to provide the electrical needs for a community of 280,000 people. And "K&M" Asbestos Textiles help keep equipment such as this on the line.

"K&M" Asbestos Tape has the physical and dielectric stamina and resistance to high temperatures to protect the vital parts of electrical machinery like this. This tape is resilient and stable enough to last the life of the equipment. Excellent absorption of protective insulating or conducting resin treatments enhances the value of this material. This combination of important properties makes "K&M" Asbestos Cloth attractive as a significant part of large G-E turbine-generators.

Fireproof and flexible, "K&M" Asbestos Textiles resist moisture, fire, corrosion, high temperature, and vermin. They insulate against heat, vibration, sound, and electricity. Write to us for more information.



"K&M" Quality Asbestos Tape for Motors! "K&M" Asbestos Tape . . . for winding in motors . . . meets the same high standards of quality as does "K&M" Asbestos Textiles for use in G-E powermakers.

K·M
BEST IN ASBESTOS

KEASBEY & MATTISON
COMPANY • AMBLER • PENNSYLVANIA

Use of aluminum in a new generating station, switchyard and transmission line brings the experience and judgment of Alcoa field advisor Shorty Lowe (center) to the scene.

ALCOA RESEARCH

. . . development today for tomorrow's loads

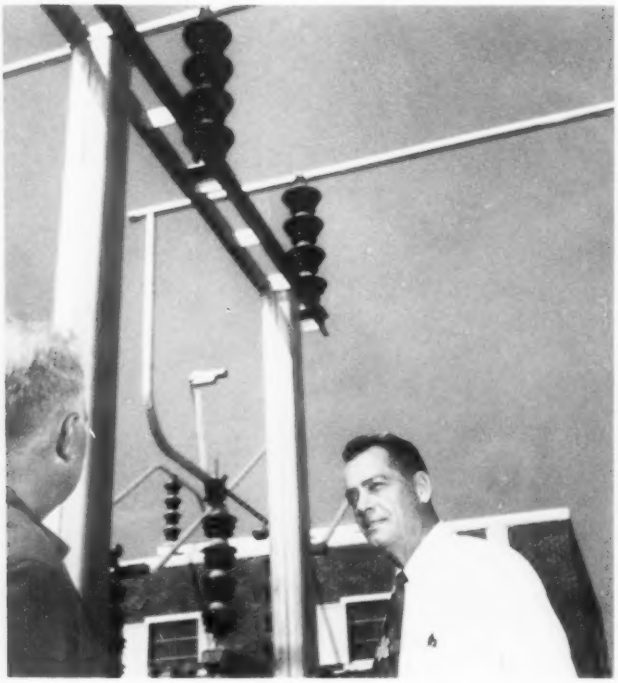
HOW ALCOA FIELD ADVISORS HELP SPEED CONSTRUCTION, REDUCE COSTS

ALCOA FIELD ADVISORS: HELPFUL ADVICE ON THE SPOT

To help solve transmission and distribution problems—before they develop—Alcoa has field advisors located at strategic points throughout the United States. These specialists are available to help utilities in three important respects: design consultation, installation and product improvement.

Each Alcoa field advisor has a common determination: to be competent, diplomatic and helpful. There are few problems in stringing, sagging or any other aspect of modern aluminum conductor installation that he has not encountered. He is a qualified expert in aluminum welding and other joining techniques. Substation erection problems are completely familiar to him. ACSR—Bus—Conduit uses are his everyday ABC's. Frequent refresher courses keep him up to date. His counsel saves thousands of dollars for utilities every year.

This extra service . . . at no extra cost . . . is another way Alcoa is helping utilities to transmit and distribute more kilowatts per invested dollar.



Inspection by Hank Meece (right) is part of the determined follow-up that can be expected from Alcoa field advisors.

Bob Hyde checks bolt assembly in an aluminum substation structure to ensure long, maintenance-free performance.

Design Consultation—Because of their broad experience, Alcoa field advisors can make many money-saving suggestions on construction methods and equipment before installing Alcoa® Conductors and Accessories.

Installation Help—At the job site, Alcoa field advisors work with construction crews on the correct application of conductors, accessories and tools. They also help solve special problems arising from terrain or type of erection equipment. They prepare inspection reports on each job they visit which are of great value to both the utilities and Alcoa design engineers.

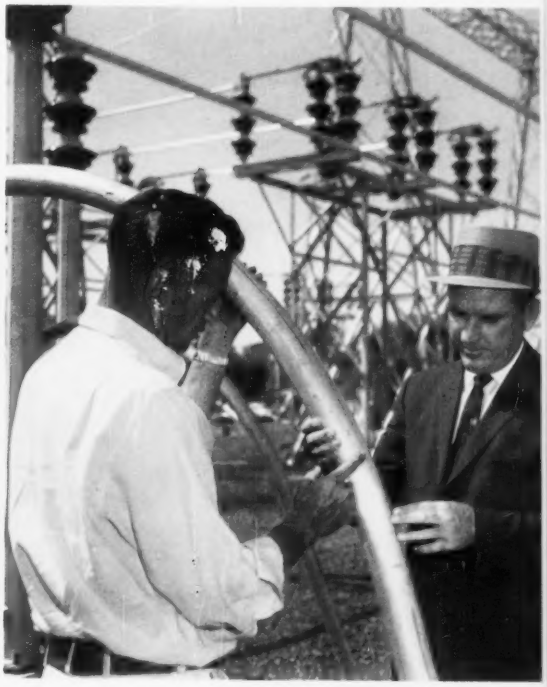
Product Improvements—Alcoa field advisors observe special problems and unusual installation features which they encounter, providing background for improvement of Alcoa products and development of new designs.

ALCOA ALUMINUM

ALCOA RESEARCH

. . . development today for tomorrow's loads

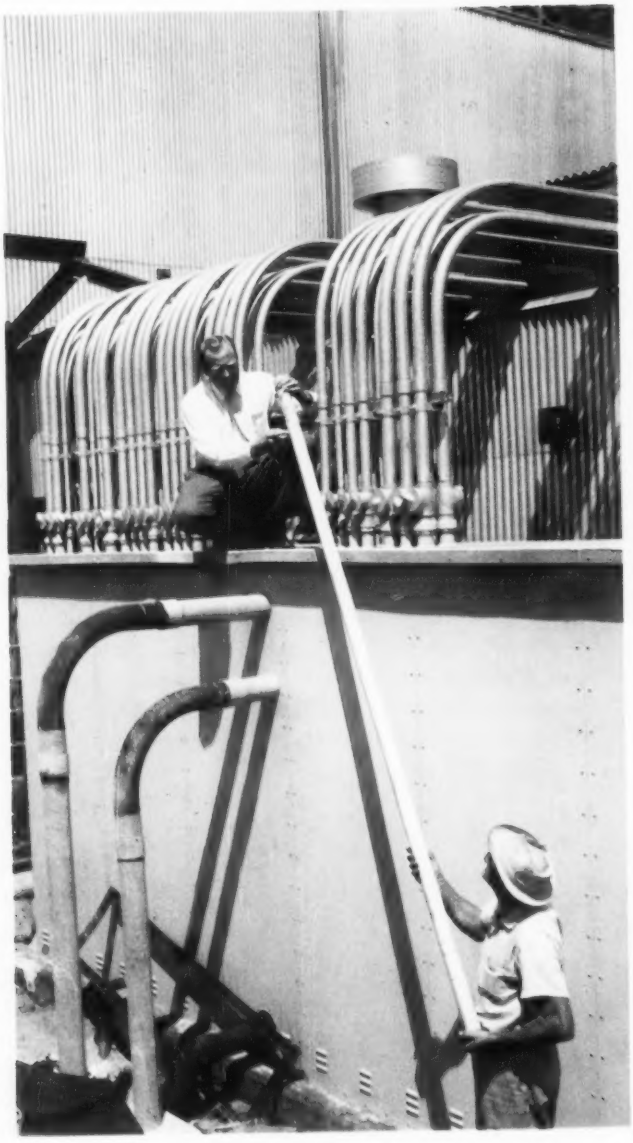
Field advisor (center) Ralph Huston's years of experience with conductor accessories can be brought to bear on any problem that might develop here.



Bill Rice (right) can tell you all about efficient installation and joining techniques with aluminum bus conductors.

ALCOA

FIELD ADVISORS HELP SERVE YOU



In picture above, Jim Sunderland's know-how helps another customer benefit from the unique performance and installation advantages of Alcoa Aluminum Rigid Conduit.

On-the-job help is the specialty of Alcoa's field experts. In picture at left, Bill Stokes checks some Alcoa ACSR on the site.

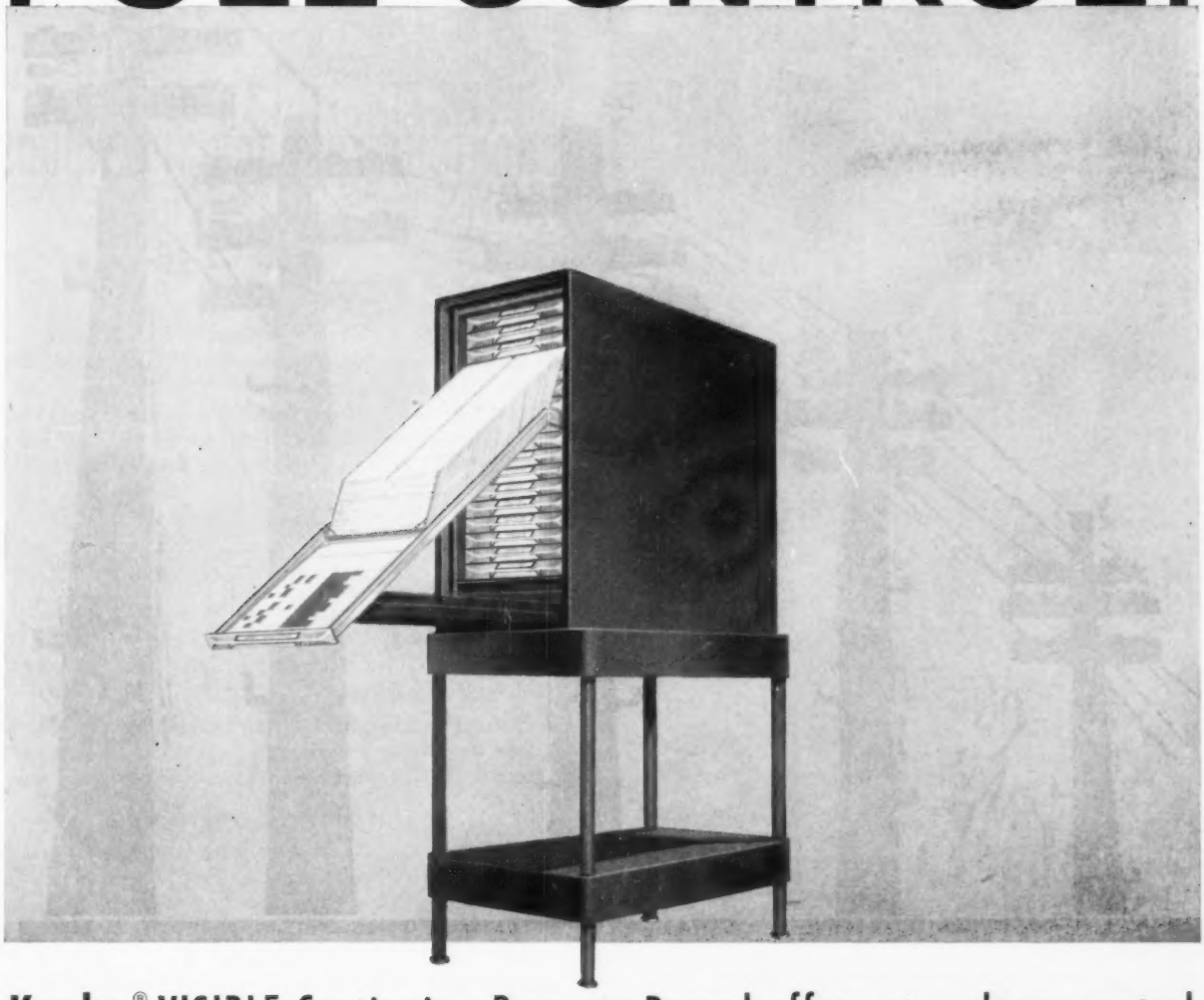
For more information on any application of aluminum in the electrical industry, call Alcoa.

ALCOA ALUMINUM

Your Guide to the Best in Aluminum Value

For Exciting Drama Watch "Alcoa Theatre," Alternate Mondays, NBC-TV, and "Alcoa Presents," Every Tuesday, ABC-TV

POLE CONTROL!

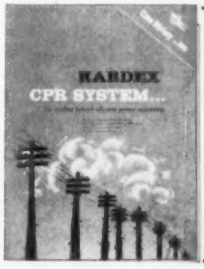


Kardex® VISIBLE Continuing Property Record offers at-a-glance control of every piece of your pole line equipment!

Can your utility boast *one* compact, centrally located CONTINUING PROPERTY RECORD that includes *every piece* of pole line equipment . . . *what* and *where* each piece is . . . when *installed, replaced, salvaged* or *sold* . . . and with all these facts always *at-a-glance?*

Every day, more utilities are turning to this kind of Continuing Property Record—made possible with KARDEX Visible equipment. There are many time-saving advantages and benefits. Trouble calls are expedited by speed of reference. Time is saved in preparing work order estimates. Information on tax districts is immediately available. Property value figures are quickly substantiated. Complete facts for joint use pole agreements are always ready.

Simply mail coupon to get this **free** informative case history giving the full story of the many cost-lowering benefits of this system.



Remington Rand

DIVISION OF SPERRY RAND CORPORATION
Room 1338, 315 Fourth Avenue, New York 10, N. Y.
Kindly send free Case History 1198 on "Continuing Property Record".

NAME_____
COMPANY_____
ADDRESS_____
CITY_____ ZONE____ STATE_____

POWER LINE TAKES A SHORTCUT THROUGH THE WOODS ON ITS WAY TO SCHOOL

In Pittsford, N. Y., Rome's preassembled aerial cable took the shortest route through a densely wooded tract of land to provide power for a new school.

Rochester Gas & Electric had the problem of supporting the cable against possible storm damage in the heavy thicket. Here's why they chose Rome's 5-kv preassembled aerial cable for the job:

1. Falling branches—or even trees—can be supported by the cable itself, says Line Maintenance Supervisor James E. Cooper.
2. Tree trimming probably won't be required for another five years, in contrast to the normal two-year period for open-wire systems, according to Carl Foster, Foreman of Monroe Tree Surgeons.
3. Preassembled aerial cable can be installed much faster than its open-wire counterpart, says Bob Tanner, Foreman of R. E. Tanner Line Construction Co.

You get these added advantages

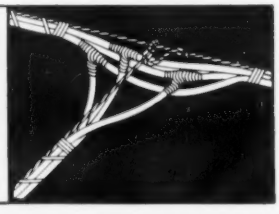
Improved regulation. Aerial cable has a lower reactance than open-wire systems—so voltage drop is approximately half as great. Similarly, for a given allowable voltage drop, power can be transmitted twice as far.

Mid-span tapping. The reverse-lay construction of Rome's preassembled cable eliminates the necessity of making taps only at the pole ends of the installation.

Improved appearance. No additional crossarms are needed with Rome's preassembled cable . . . the installation is simple, uncluttered, modern in appearance.

For more facts on this cable that can help *you* shortcut installation, operating, and maintenance costs, contact your nearest Rome Cable representative or write to Dept. 771-B, Rome Cable Corporation, Rome, New York.

In urban areas, long spans like this one might make mid-span tapping necessary. The reverse-lay construction of Rome's preassembled aerial cable permits tapping anywhere along the line (see diagram, at right).



ROME CABLE
CORPORATION

ANOTHER GENERAL ELECTRIC ***Kilovar Plus...***

STAINLESS-STEEL Capacitors by General Electric Eliminate Repainting, Cut Maintenance Costs

W. G. HART, *Manager—Power Capacitor Sales, points out G-E capacitor corrosion-resistant feature.*

GENERAL ELECTRIC STAINLESS-STEEL CASE POWER CAPACITORS eliminate leaks caused by corrosion or rust, keeping bothersome inspections and costly maintenance to a minimum. You can use G-E capacitors to supply kilovars anywhere, regardless of atmospheric conditions. They are not affected by corrosive salt-water spray found along coast lines and resist chemical agents in industrial areas.

NO PAINT MAINTENANCE IS REQUIRED, either. This means substantial savings for you. For example, many utility engineers estimate that capacitors with ordinary case material have to be taken off the pole or out of racks for repainting at least once or twice during their service life, at a cost of $8 to $10 per repainting. Because G-E stainless-steel capacitor cases require no protective repainting, you get a direct savings in system maintenance.

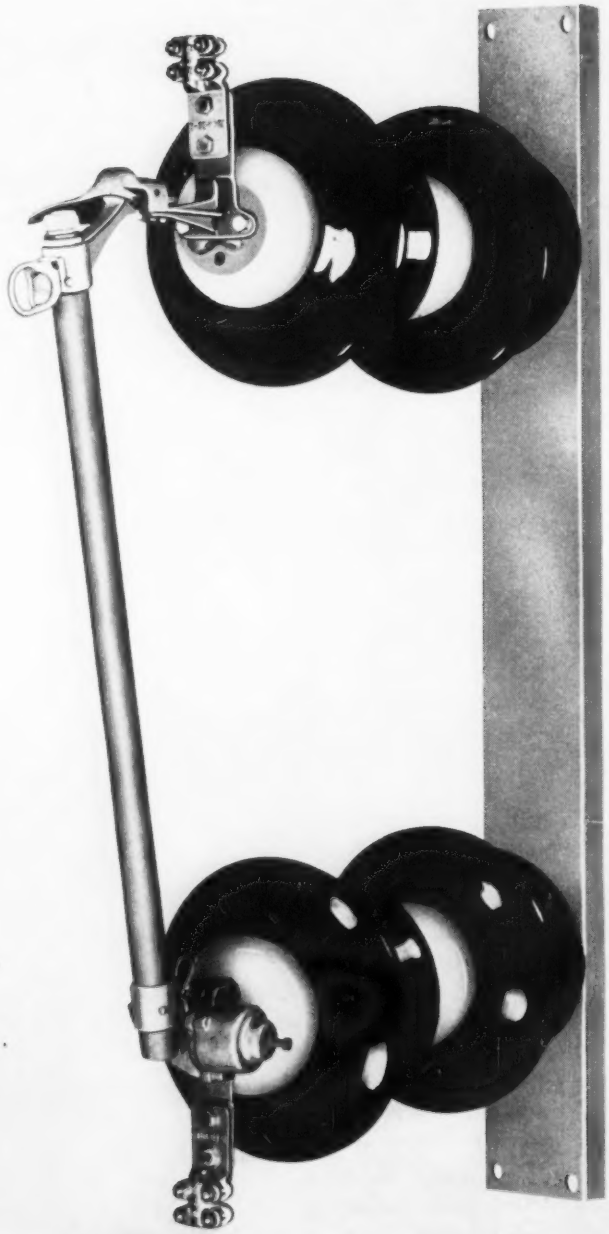
THE STAINLESS-STEEL CASE is a standard feature of all G-E 25 and 50-kvar power capacitors and 3, 5, and 7.5-kvar residential secondary capacitors.

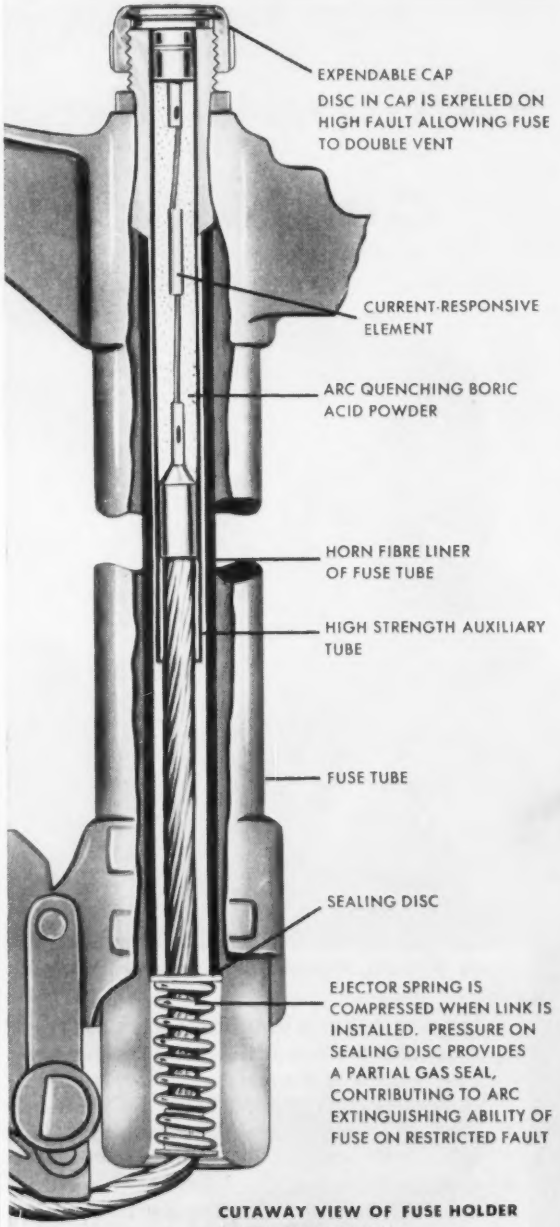
SEE FOR YOURSELF how General Electric's stainless-steel capacitors can help you cut maintenance costs. Contact your nearest General Electric Apparatus Sales Office, or write to Section 445-25, General Electric Co., Schenectady 5, N. Y.

Progress Is Our Most Important Product

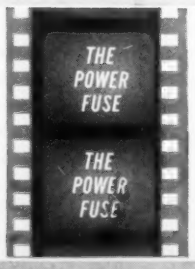
GENERAL ELECTRIC

A Reliable New Family of P




EXPENDABLE CAP
DISC IN CAP IS EXPELLED ON HIGH FAULT ALLOWING FUSE TO DOUBLE VENT
CURRENT-RESPONSIVE ELEMENT
ARC QUENCHING BORIC ACID POWDER
HORN FIBRE LINER OF FUSE TUBE
HIGH STRENGTH AUXILIARY TUBE
FUSE TUBE
SEALING DISC
EJECTOR SPRING IS COMPRESSED WHEN LINK IS INSTALLED. PRESSURE ON SEALING DISC PROVIDES A PARTIAL GAS SEAL, CONTRIBUTING TO ARC EXTINGUISHING ABILITY OF FUSE ON RESTRICTED FAULT

CUTAWAY VIEW OF FUSE HOLDER AND LINK ASSEMBLY



Don't miss this sound movie in full color..."The Power Fuse"

It is available, without cost, for viewing by anyone interested in power fuses. On-the-spot results of field tests conducted in conjunction with a leading utility. Factual, informative, well worth your time. Contact your Southern States representative to arrange a showing, or write direct to the company.

Power Fuses by Southern States

- POSITIVE CLEARANCE OF RESTRICTED FAULTS
- HIGHEST INTERRUPTING RATINGS AVAILABLE
- WIDEST RANGE OF SELECTION
- SIMPLIFIED CONSTRUCTION

Reliable performance—to provide dependable protection against high or low fault currents—is one of the most important requirements demanded of power fuses by engineers. With this uppermost in mind, we developed our new family of power fuses.

Extra reliability in clearing restricted faults is provided by the new, dual-operating characteristics of the expendable cap and arc-quenching boric-acid fuse link.

Extra reliability in handling high faults is provided by the double-venting action, fibreglass tubes and other design features—resulting in interrupting ratings approaching 3½-million kva at 161 kv.

A wider range of selection permits adequate fusing without buying excessive interrupting capacity.

The expendable cap and the sealing disc at the lower end of the fuse prevent the entrance of moisture or extraneous matter. Patented electrostatic shielding eliminates corona damage. A built-in snubber brings the fuse holder to a cushioned, shock-free stop. All in all, this rugged new family of power fuses is engineered to provide completely reliable service for many years.

Get the full story from your Southern States representatives, or write for Bulletin 59PF.

RE-FUSING IN THE FIELD IS QUICK WITH SOUTHERN STATES FUSE KITS

Economical fuse kits, with all of the components necessary for re-fusing in the field, are available for all Southern States Power Fuses. Four speed ratios—clearly marked, compact packages.

PIONEERS IN POWER FUSES SINCE 1924

SOUTHERN STATES EQUIPMENT CORP.
HAMPTON, GEORGIA

IN CANADA: Dominion Cutout Co., Ltd., Toronto

This Man Can Help You Get More Efficiency From Plant Equipment

Efficiency is what you want from your plant equipment, and the Dowell engineer can help you get it. Plants in every major industry—for example, oil refining, chemical, public utility, steel and paper—are getting productive results from *economical* chemical cleaning by Dowell.

To remove scale and sludge from your process equipment, boilers, tanks and piping, Dowell engineers provide knowledge and tools you can get from no other chemical cleaning service. You get cleaning knowledge gained from developing and working with the rigorous cleaning standards of the missile program at Cape Canaveral. You get new tools and chemicals from a continuous research program. For example, Dowell recently introduced a new high-velocity jetting device for cleaning tube bundles.

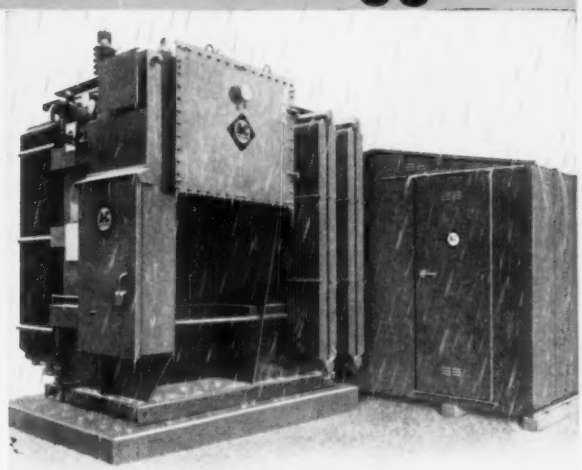
And you get 20 years' worth of experience in all types of industry from Maine to California. Plant operators find it pays to call Dowell on even the smallest job. But they also know that Dowell has the manpower and equipment to clean the largest and most complex systems.

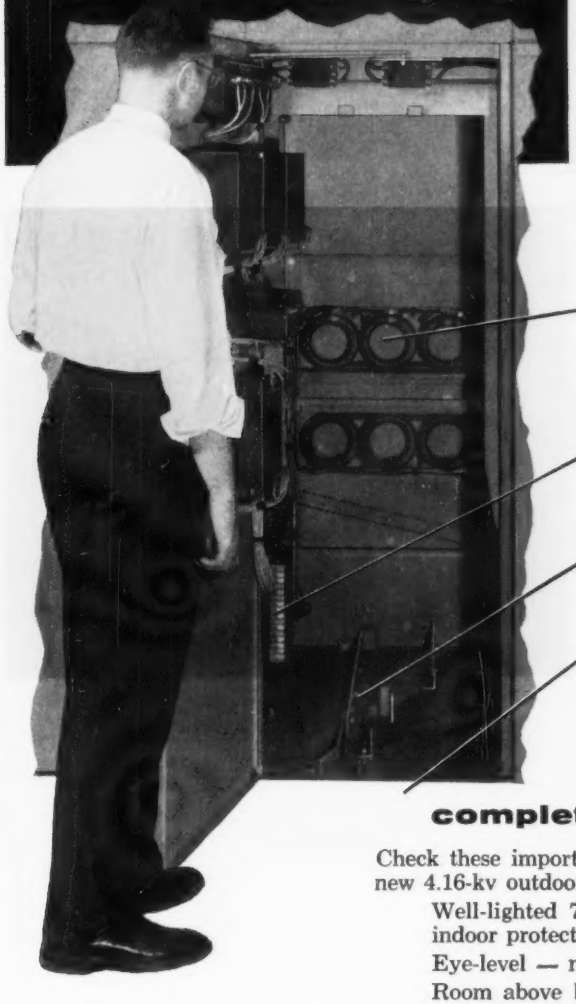
The Dowell engineer takes pride in doing your job so well that you will continue to call him for your cleaning work. This desire to do your job well covers every facet of service—from seeing that you get solvents exactly as specified, to supervising Dowell's full-time safety program. Every precaution is used to protect your personnel and equipment.

Prompt service and detailed information is yours from any of the 165 Dowell stations and offices. Get more efficiency—economically—with the help of the largest, the oldest, the most experienced chemical cleaning service—Dowell, Tulsa 1, Oklahoma.

Chemical cleaning service for all industry DOWELL
DIVISION OF THE DOW CHEMICAL COMPANY

ALLIS-CHALMERS modern line for '59





- Aisleway accessibility — current transformers in front of positive-acting shutters.
- Automatic connecting, self-aligning secondary disconnects — no plug jumpers.
- Interlock-guide track self-aligns breaker.
- Flush mounting with floor eases breaker insertion.

NEW Shelter-Clad . . .

completely accessible switchgear

Check these important "accessibility" features of Allis-Chalmers new 4.16-kv outdoor switchgear:

Well-lighted 75-inch-wide service aisle for clean, roomy, indoor protection.

Eye-level — no stretch — instrumentation.

Room above breaker to house potential transformers or control power transformer fuses.

Relay, rectifier, and capacitor elements are mounted on breaker for easy access when breaker is in aisleway.

Standard secondary terminal blocks are accessible from inside aisleway.

In addition to these "accessibility" features, you get *Pyro-Shield* track-resistant insulation plus unique personnel safety features.

Get all the details from your nearby A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

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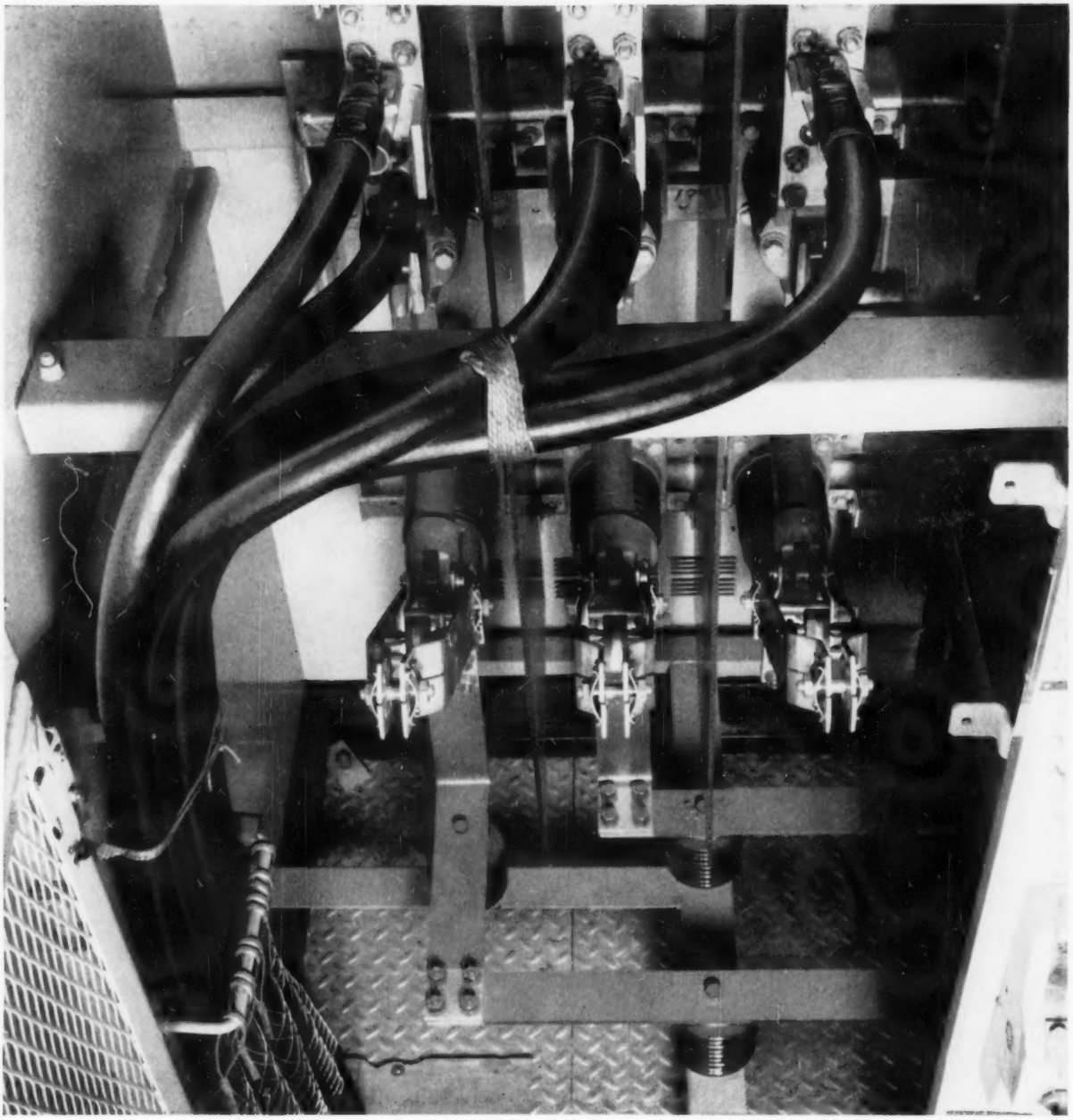
A-5918

ALLIS-CHALMERS



FOR EFFICIENCY AND LONG LIFE *Specify Kerite Cable*

This 5KV unshielded cable used for power auxiliary service in an important new central station is typical of Kerite engineering to provide reliable installations in restricted space at minimum cost.

Plant engineers can "have their cake and eat it too." Hundreds of these Kerite non-shielded installations have been operating over the last 18 years without troubles or interruptions.

The reputation of Kerite insulation for long-lived resistance to the elements should make it the first choice of the power plant engineers.

KERITE CABLE

...it's the KERITE *that makes the difference...*

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Editorial Comment

MARCH 9, 1959

The Slide Rule, Gentlemen, Isn't Everything!

Two very prominent engineers, before two great engineering societies, recently called on their engineering colleagues to assume a greater responsibility in the cultural and civic life of their communities and nation.

Dr. James T. Killian, president of Massachusetts Institute of Technology, and Howard C. Pyle, newly installed president of the American Institute of Mining, Metallurgical and Petroleum Engineers, made their pleas separately, and in somewhat different words, but essentially they asked for the same thing. And both practice what they preach. Killian is chairman of President Eisenhower's Scientific Advisory Committee, and has held a number of other public and civic posts. Pyle is active in Los Angeles community affairs, and has purposely acquired a background as geologist, engineer, wartime invasion planner, and banker.

Killian asked the winter general meeting of AIEE to help "raise the level of the engineering profession to that of the other professions—law and medicine—and the arts . . . in order to command a greater respect from the community and the country." According to Pyle: "It's time, engineers assumed much greater responsibility in community and national affairs, especially since more and more of them are rising to top corporate management. They've confined their interests too much to professional matters in the past."

Perhaps this charge arises from the all-too-human tendency for engineers to look at their technological accomplishments and the marvelous machines they've created in connection with these accomplishments as ends in themselves. Other professionals do this also, but probably to a lesser extent.

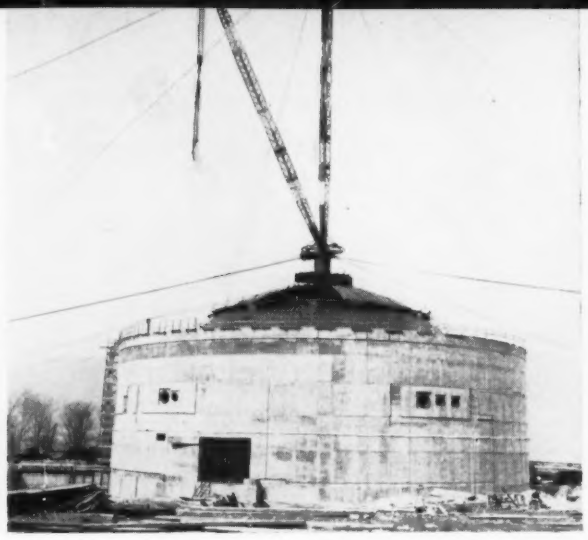
After all, the significance of technology lies not in itself, but in what it does to enhance human values. Democracy operates best in economic abundance, and the engineer, through his consummate skill and dedication, has done more than most to help create that abundance. But after all, it is the DEMOCRACY that is the end, not the abundance. And it is time he turned his talents toward making that work better by participating more actively in it.

Electrical Historical Foundation Needs Help

The Electrical Historical Foundation was organized three years ago in order to help preserve valuable historical electrical equipment. The Foundation has been quite successful in locating equipment and has placed some of it in storage in order to preserve it. The results to date have been due to the efforts of E. S. Lincoln who originated the idea and a few organizations who backed him.

The Foundation is only interested in seeing that the valuable historical equipment is first preserved and then placed in an appropriate museum. It does not intend to try to finance a museum. But the Foundation needs money to accumulate, repair, and store equipment which will eventually find a place for display. The final location could be in the Smithsonian Institution, Ford Museum, a proposed museum at the Adams Station of Niagara Mohawk Power Corp, or other locations.

But until that time, we need financial help to carry out our first objective.



INDIAN POINT nuclear plant of Con Edison will go into operation in 1961, a year later than originally set, and at total cost $10 million higher than expected a year ago. Despite problems, "We do not regret our original decision to construct the . . . plant," Fairman told joint committee. Reactor vessel, above, is about one-half completed, he said.

Spotlight Focuses Again on A

While the Atomic Energy Commission and the Joint Congressional Committee on Atomic Energy argued in Washington on the adequacy of U. S. nuclear power progress, Elmer L. Lindseth presented a summary of the broadening scope of electric utility efforts to develop the peacetime atom.

Lindseth, chairman of Edison Electric Institute's Committee on Atomic Power and president of Cleveland Electric Illuminating Co, told the joint committee that more than 131 electric utilities are in an industry-wide atomic program.

Ten projects in operation, under construction or under contract will cost utility companies about $375 million. Five other projects in the planning or negotiation stages are expected to boost the outlay above $540 million, he said.

R&D Projects Under Way

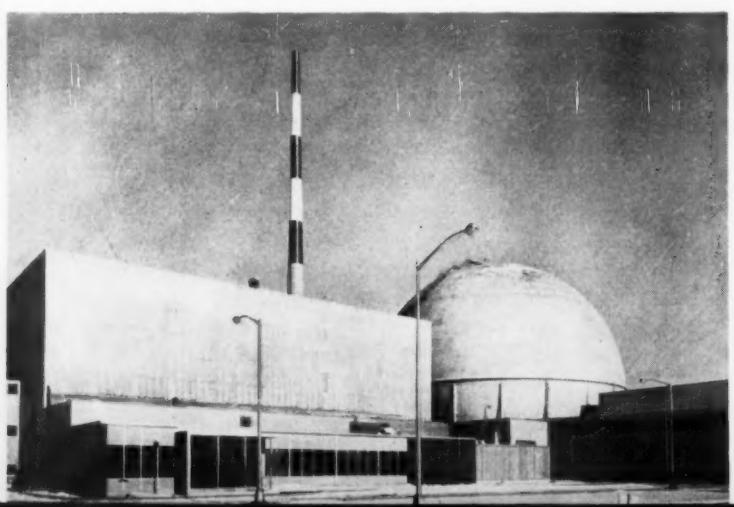
In addition to this, "substantial expenditures" will go for 11 other research, development and study projects in which utilities are participating, Lindseth said.

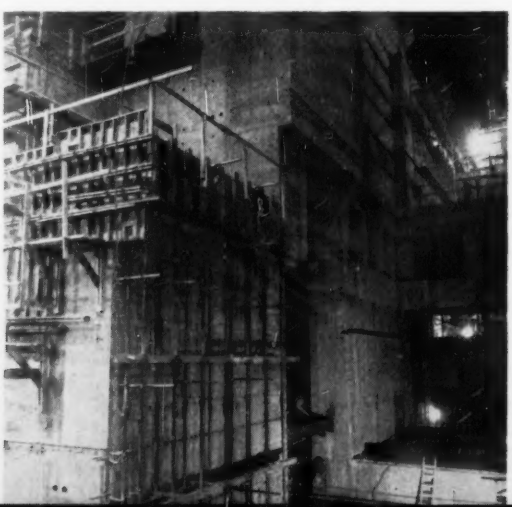
The industry's progress is not without problems. The cost factor has hit Consolidated Edison Co of New York, Inc, for example, on its 275,000-kv Indian Point station. The estimate on total cost has been raised to $100 million from $90 million reported a year ago, the company's senior vice president, James F. Fairman, told the committee. This "is almost wholly attributable to price escalation."

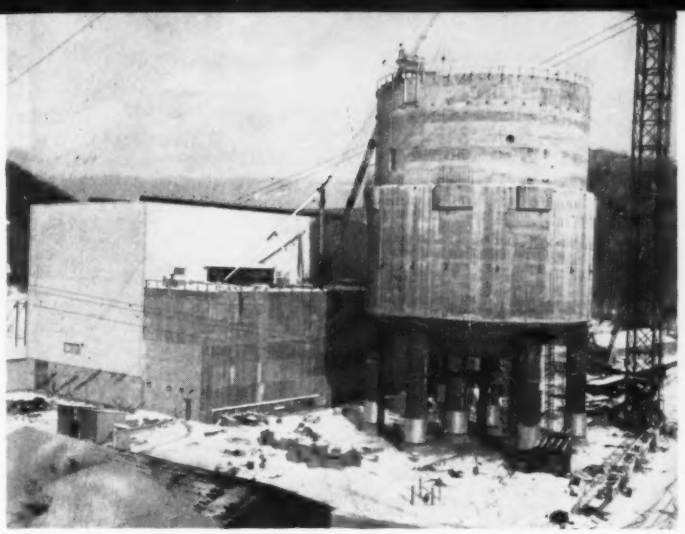
Fairman described Con Ed's choice of a uranium-thorium fuel cycle that had to be altered when research indicated that a reactor core with metallic thorium might fail prematurely. Instead, an oxide core was selected in 1956.

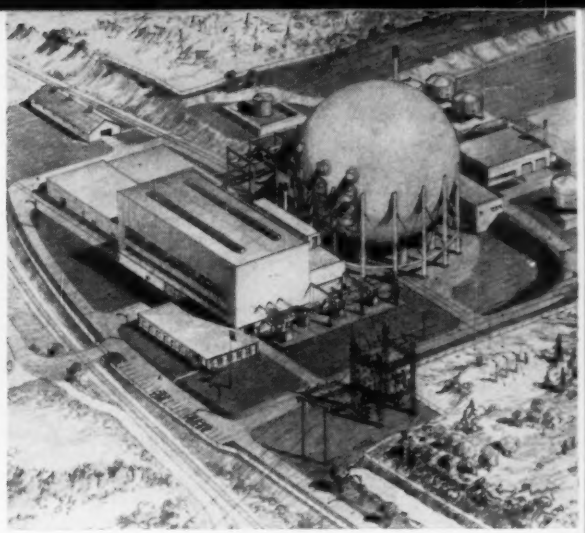
This is one of the problems that has set back the plant's actual date

DRESDEN STATION, now about six months ahead of schedule, is at stage where main buildings, left photo, are enclosed. Right photo shows interior of 190-ft sphere; when 300-ton reactor vessel is installed, remaining shielding walls will be erected to complete work. Contract price is $45 million, with $15 million slated for R&D









YANKEE PLANT R&D promises savings through use of stainless steel instead of zirconium alloy for fuel material containment, and because of streamlined fabrication proceedings. The Rowe, Mass., facility is expected to go into service in late 1960 at an estimated cost of $57 million. Artist's conception, above, shows how sphere will look

A-Plant Progress and Problems

of operation a year to April 1, 1961, Fairman said. All site preparation work has been completed. The 5-ft thick concrete shield has been constructed and the containment sphere —inside the shield—will be ready by this May, he said.

Target date for completion of the Enrico Fermi plant's containment building is June, 1959. Installation of reactor vessel externals, internal shielding, thermo-couples and other fittings is near completion. The primary shield tank and steel plate for the secondary shield wall have been erected. To meet the spring schedule for non-nuclear tests, the primary sodium piping is being installed on double shifts.

Fermi Target Date Is 1960

Other major facilities for the nuclear portion of the 90,000-kw Fermi plant are moving forward rapidly. Substructure for the turbine-generator building was completed last December and erection of structural steel is scheduled for completion at the end of this month. Detroit Edison Co is coordinating construction of turbine-generator structure, which should be ready for operation in August, 1960.

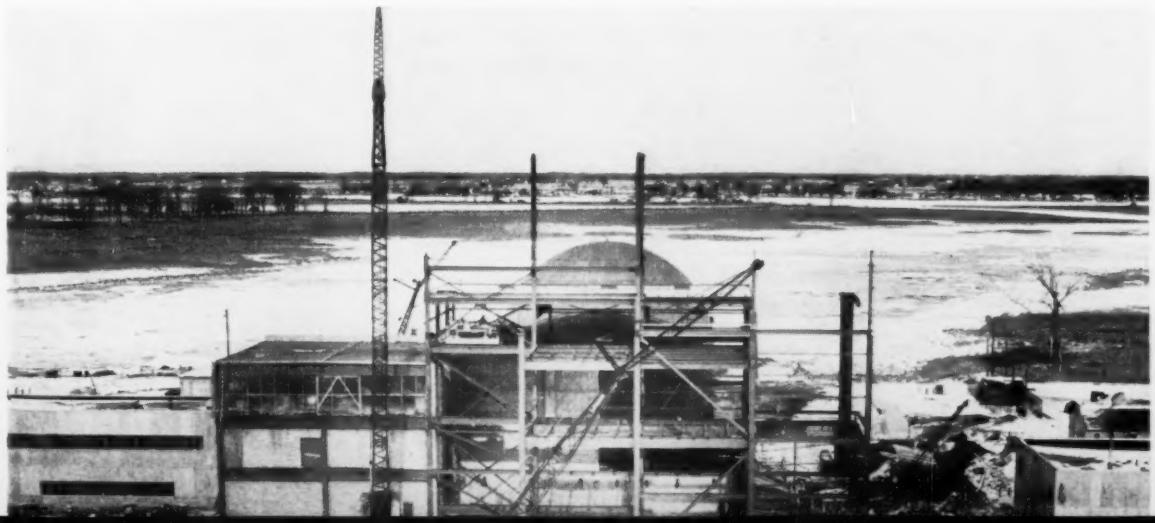
Work on Commonwealth Edison Co's Dresden station is now about 70% completed. The plant is expected to be placed in regular operation about six months ahead of the original completion date of December, 1960.

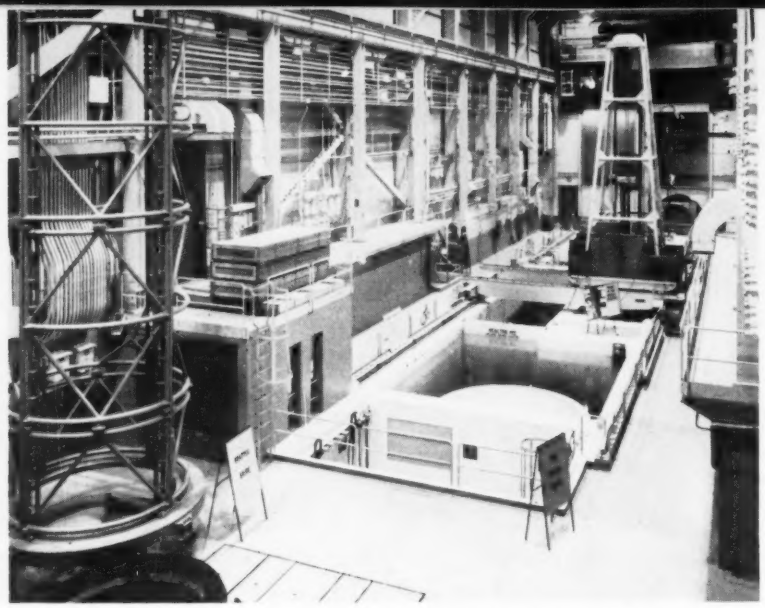
Installation of the 300-ton reactor pressure vessel will begin soon after its arrival this month from New Jersey. The vessel was routed entirely by water.

About one-third of the nuclear fuel has been delivered to Dresden from General Electric's San Jose, Calif., atomic department. Initial reactor loading will start this fall.

Yankee Atomic Electric Co's re-

ENRICO FERMI plant's completed staff facilities, far left, are now ready for partial occupancy. Adjacent structure to house controls is nearly finished and structural steel work for steam-generator building is now completed. June, 1959, is target date for completion of reactor containment building and non-nuclear testing is scheduled to begin this spring





SHIPPINGPORT experience indicates performance will surpass design specs in number of major areas, Duquesne Light Co says. Since July 1, two 1,000-hr full power runs were held. This view shows fuel control room

search and development, in cooperation with the AEC, is now over 75% completed. One major Yankee change from the R & D is the use of stainless steel to contain the fuel material, instead of expensive zirconium alloy. Use of stainless steel, in conjunction with boric acid in the cooling water as a soluble neutron absorber, has reduced the number of control rods.

The 134,000-kw Rowe, Mass., undertaking will have a pressurized water reactor contained in a 125-ft sphere.

Latest development on the A-power scene is government-supported research for a gas-cooled, heavy water-moderated reactor concept which, in a later 200-Mw version, could operate on natural uranium.

East Central Nuclear Group and Florida West Coast Nuclear Group have contracted with AEC for the R&D, which will cost $18 million. This will be shared about equally by AEC and the East Central group. The Florida group will pay $26 million in construction costs for the 50-Mw prototype.

The Vallecitos boiling water reactor plant has received AEC's signal to boost maximum thermal output to 50,000 kw. The original limit was 20,000 kw. Excess heat over that usable by Pacific Gas & Electric Co's 5,200-kw turbine-generator is dumped to the condenser. To date over 17-million kwhr have gone over PG&E's lines from the GE facility, which has been used to test Dresden fuel elements.

PG&E's Humboldt Bay nuclear unit is under active design. Construction is scheduled to start on the 50 to 60,000-kw unit in spring, 1960, with operation set for mid-1962. It may lack the spherical of cylindrical pressure-containment vessel required until now by high-pressure reactors. A "pressure suppression" system is being developed by GE and PG&E. If successful, it could obsolete the high-cost containers. In the proposed system, steam released by an "incident" would be condensed in a big, low-cost water tank sealed underground, permitting the reactor to be housed in a cheaper low-pressure vessel.

Committee Criticizes Program

While Lindseth called these and other industry projects "both substantial and adequate on the basis of domestic considerations," the appraisal of the Democratic-run joint committee was critical.

As for the ruffled tempers that marked the opening of the "202" hearings, efforts are under way to develop a program which will be acceptable to the AEC and the joint committee. John McCone, AEC chairman, has already taken the first step toward conciliation. But initial Democratic reaction indicates it isn't enough to suit them.

Following the hearing, McCone submitted a revised AEC program that includes:

- A decision to go forward, after all, on the 75-Mw sodium graphite reactor proposed by Consumers Public Power District. McCone testified at the outset—to the irritation of the committee—that the project probably would be delayed three years. The turn-about will avoid severe financial penalties on CPPD.
- Added language to AEC's authorization bill making it clear that co-op or municipal systems could qualify for "partnership" development of the small reactor in the AEC program under rules comparable to the old "second round."
- New assurances that proposed financial grants toward nuclear plant construction would not be allowed to become a "windfall" for private utilities, as feared by public power spokesman.

50% Outlay Needed for Grants

To qualify for capital grants, explains McCone, a utility (public or private) must provide the site, all conventional equipment and enough toward construction of the nuclear portion of the plant to bring the utility's share of the total capital outlay to at least 50%.

In addition, federal payment would be subject to refund if costs prove lower than expected, but there will be no upward adjustment if costs run high. Finally, says McCone, no portion of any AEC construction assistance will be included in the capitalized value of the plant used for rate making.

Sen Clinton Anderson (D-N. M.) lost no time in pointing out the program's remaining "deficiencies."

The AEC bill doesn't provide for joint committee review of the basis for proposed cooperative arrangements with power organizations, he says. And the committee "will want to consider additional projects" such as prototype construction at AEC sites of: **1.** A heavy water moderated and cooled natural uranium reactor. **2.** An intermediate-size organic reactor between 50 to 100 Mw.

With respect to established reactors, "We may wish to consider" helping industry build a 75 to 150-Mw demonstration plant, and aiding a rural co-op or public power body to build an additional 20 to 60-Mw reactor, Anderson says.

Tornado Trial Is Met By UE Disaster Plan

Service for nearly 50,000 St. Louis customers was restored in 24 hours with smooth-working emergency measures

When a tornado struck St. Louis at 2:15 am Feb. 10 it interrupted service to 50,000 customers, took down primaries at 236 locations, interrupted service on 27 4-kv feeders, five 12-kv feeders and five 34-kv feeders. It leveled 49 poles and caused 19 cases of transformer trouble. There were 4,000 "lights-out" calls.

Within 24 hours service had been restored to all buildings that were in condition to receive service. This was accomplished without calling for help from neighboring utilities, although several called to offer help.

Key to this performance was the smoothness with which Union Electric Co's Emergency Service Restoration Plan worked. The plan had only been established in recent months. It was patterned partly after hurricane plans of some Eastern companies. Basically, the plan calls into play the entire manpower of the company, with engineering and operating personnel directing the efforts of those not familiar with the system and with operating procedures.

The long-developing emergency plan is directed at marshalling a maximum force and getting it into action in a minimum time. UE found from its tornado trial that it is necessary to set the plan in motion early, just as soon as it appears likely that there will be too much for the normal operating force to handle.

In line with this thinking General Foreman R. E. Stoecker, who had been called immediately, suggested at 2:37 am that the plan be set in motion. By 2:45 am, 30 minutes after the tornado struck, W. R. McMillan, manager of the T&D operating department, set the plan going.

After 2 Hours—500 Men in Field

Two hours and 15 minutes after the tornado struck, 500 men were in the field. This constituted most of the available crews of St. Louis and St. Louis County.

By 6:15 am, UE's cafeteria was set up to serve sandwiches and coffee. At 8:00 am an appraisal indicated more help was needed in the field. Twenty-one crews, consisting of 111 men, from the company's outside districts were called into the general disaster area.

PHONE EXCHANGE AREAS were basis for coordination and appraisals

Before the emergency was over a total of 1,080 employees were participating, 890 in the field and 190 in the office.

Here are the details of the smooth-functioning plan:

- Service area is divided into small sections for easier handling. These sections are identical with the telephone exchange areas. When calls come in the customer is asked for his telephone number, which identifies the emergency plan area to which the call is assigned.
- The phone-exchange areas are the size with which engineers and others can become familiar. If a large number of calls is received the distribution group can work a large

(*Continued on page* 110)

Priest Brands Ad Ruling 'Unjustly Discriminatory'

"Unjustly discriminatory," a limitation on the right to free speech, and beyond the Federal Power Commission's authority—In these words, A. J. G. Priest criticized FPC staff arguments that electric companies should be prevented from justifying as reasonable business expenses their contributions to a 1957 Electric Companies Advertising Program series in a case pending before FPC.

The FPC staff claims that the commission should consider only whether the nine questioned ECAP ads are politically controversial, and if so found, that the ads should be paid for from company surplus and not figured into the rate base.

Priest, counsel for most of the utilities, made his charges last week before the full commission. Edward B. Marsh, FPC presiding examiner, has postponed hearings on the accounting status of the ECAP ad contributions until the full commission can rule on testimony to be included (EW, Jan. 12, p 49).

Priest cited two specific reasons for his criticism:

- The FPC Uniform System of Accounts calls for placing certain payments in the below-the-line category No. 538 (where the FPC staff wants ECAP contributions placed) only when there is a showing that these payments cannot be placed above the line as "just and reasonable" expenses.
- Section 301 (a) of the Federal Power Act requires utilities to "justify" any accounting entries questioned by FPC.

PRIEST: Criticize FPC staff

Priest also said that a previous "schism" among attorneys for the 76 utilities—on whether to admit that the nine ECAP ads are politically controversial—has been settled. All attorneys, Priest included, now feel these ads are not controversial, as defined by applicable laws and FPC regulations. This, then, would be the united front on which utilities would fight their case, if the full commission decides that testimony before Marsh is to be limited only to the question of political controversy.

A Different Case

"Politically controversial," Priest said, is held to mean an attempt to influence specific elections or legislation. The ECAP case differs from the Cammarano case—recently decided by the U. S. Supreme Court—in that the ECAP ads are not directed toward specific legislation, while Cammarano's ads were. (In the Cammarano case, the Supreme Court held that a beer wholesaler could not deduct as business expenses his contributions to fight an initiative measure aimed at placing beer sales under state control.)

Priest said the Cammarano case did not affect his charge that an adverse ruling in the ECAP case would infringe on the utilities' right of free speech. He said the Cammarano case involved a legal ground where accounting practices could be questioned.

Congressman Joins Attack on TVA Heavy Equipment Imports

While TVA last week explained its reasons for buying a steam turbo-generator from an English firm, Rep John Dent (D-Pa.) introduced a resolution in the House calling for a halt in TVA's foreign purchases until the Office of Civil & Defense Mobilization and the Secretary of Labor can comment.

Dent's resolution (H. Res. 186) was referred to the Public Works Committee. Dent has opposed foreign purchases since the Elliott Co (in his district) lost out to Brown-Boveri of Switzerland in a bid to supply two turbines for a co-op.

TVA issued this four-point justification of its award to C. A. Parsons, Ltd: **1.** The evaluated Parsons bid was more than $6-million (about 50%) lower than either domestic bidder—General Electric and Westinghouse. **2.** TVA fully complied with the Buy American Act. **3.** Parsons is "qualified, technically competent and adequately equipped" to build and deliver the 500-Mw turbo-generator on schedule. **4.** Parsons is "able to provide promptly any repair service. . ."

TVA emphasized that money for the unit "will not come from taxes. The cost will be met from power revenues . . ." And, the authority claimed, "There will be a net benefit to American labor" by purchasing from the English firm. "TVA will make payment in dollars for its purchases from Parsons," and either British firms or others "will in turn use the dollars to make purchases in the U. S."

GE and Westinghouse disqualified themselves on the bid by refusing to agree to payments for late equipment delivery, TVA said. Both were criticized by TVA for upping prices over 50% since 1951 while wholesale prices increased "about 5%."

The U. S. firms had this to say:

GE criticized a Los Angeles recommendation for two 200-Mw Brown-Boveri generators. This and TVA's award may lead to "a dangerous precedent" of "considering price alone . . . and disregarding the national security . . ." Westinghouse stressed security, too, in asking OCDM to cancel TVA's contract, adding, "If prices are decisive, all units purchased (by TVA) will be foreign equipment."

Doble Reports Improved Oil Tests

Client Conference told new phase control voltage source has more output, better phase and amplitude accuracy

Recently developed procedures for accelerated life tests have made it possible to write a much more realistic and comprehensive specification for insulating oil, F. C. Doble reported to delegates from 139 companies at the 26th Annual Doble Client Conference in Boston. Both loss and oxidation tests are necessary to an evaluation of insulating oil, he said.

P. L. Bellaschi, consultant, indicated that the quality of insulating oil becomes even more critical as additional EHV equipment comes into use. Solid insulation, with oil as an integral component, will be used in higher voltage transformers, he predicted.

In power transmission economics and phase control, Doble has developed a device which offers the accuracy and effectiveness of a potential transformer, but requires only a capacitor or bushing type capacitance tap for connection to a high voltage line. In the 132-kv class, it provides a 125-w output with a variation of less than ± 2 min from zero to full load. One model is applicable on 66 to 340 kv and can be used also to measure bushing power factor and determine phase conditions at any point on a system. In the future, system load dispatchers may be able to consider the phase relationships of individual generators, Doble said, pointing out that the unit with the best coal rate often may not have the best phase relationship.

A first draft of the Doble Client Committee Recommended Guide the Field Tests on Cables and Accessories is expected to be ready for publication within the year. A decision has been made to extend the Lightning Arrester Field Test Guide to include distribution type arresters. Similarly, the Reference Book on Insulating Liquids will be enlarged to cover cable oils.

Using power factor tests to evaluate the internal insulation of individual stator coils saved about 80% of the costs of rewinding a large hydro-generator, reported R. G. Brearly, Aluminum Co of Canada. Although tedious, the process permitted company engineers to determine reliably which coils could be safely reused.

R. H. Petersen, Northern States Power Co, said reclamation of insulating oil costs his company about 13¢ per gal, based on five years experience with about 95,000 gal annually. Northern States is investigating the use of a trisodium phosphate wash.

Describing a three-year experience with epoxy resin splice insulation, R. A. Horenburger, Philadelphia Electric Co, reported four failures, all attributable to poor joint preparation, among 333 4-kv joints. In 200 taped joints for the same application, PE experienced no failures. These joints were prepared by unskilled personnel, but the normal availability of skilled splicing personnel in a utility minimizes this advantage, he said. In similar tests with epoxy resins on 13.2-kv splices, he reported a lack of uniformity in the material, a disagreeable odor when the resin is burned, and failures on electrical tests.

In a symposium on preparing power transformers for service, C. Hartley and R. H. Knight, New England Electric System, advocated factory tests of the resistance of all taps to make certain that leads are properly assembled. Adequate factory thermal tests are also desirable, they said, both for test purposes and to provide detailed information on the thermal characteristics of the unit.

Spark Minneapolis Meeting

Pathfinder Plant, shown in the architect's rendering, was focal point of discussions of nuclear power generation at University of Minnesota, Minneapolis, Feb. 9. Meeting participants were, left to right: Frank Verbrugge, U. of M.; A. S. King, Northern States Power Co; Cyrus Wright, Ottertail Power Co; and, A. O. Nier, U. of M. The nuclear plant is expected to be in operation in 1962.

How to Gauge Effect

Alcoa finds effect of tension and time, as well as stretch due to ice and wind is consideration in transmission design data

GEORGE H. PHILLIPS,* Electrical Conductor Div, Aluminum Co of America, Pittsburgh, Pa.

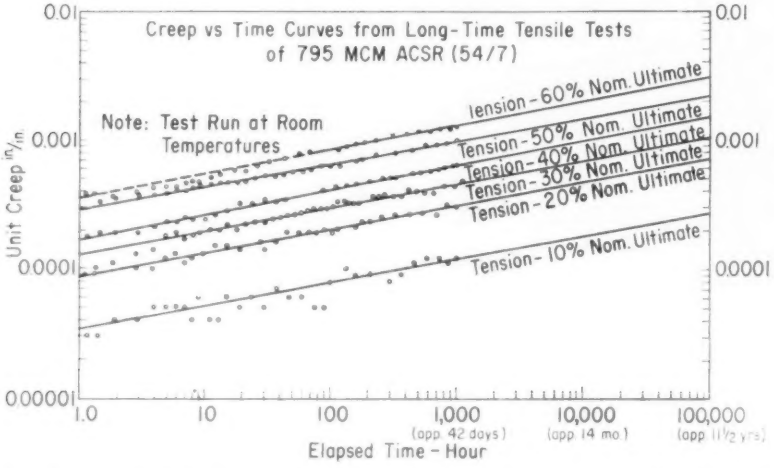


FIG 1—**CREEP RATE** increases with tension and is greatest, normally, when the first loads are applied to the conductor but continues gradually long thereafter

Non-elastic elongation or stretch of an overhead conductor may be produced rapidly by loading of ice, snow, and wind; or gradually, over a long time, without significant increase in loading. The gradual stretch is referred to as creep. Regardless of how produced, non-elastic stretch increases the sag in the span, as compared with the installed sag. To assure that clearance is satisfactory, both causes of increased sag should be considered.

Amount of creep varies with conductors; all-aluminum stretches more than ACSR. The rate of creep

*Deceased. Article was adapted from a paper presented at the Southeastern Electric Exchange Engineering & Operation Section meeting held in Biloxi, Miss.

Effects of Creep on Sags for Various Conductors, Spans, and Tensions

	795-MCM ACSR 26/7 1,000-Ft Span	795-MCM ACSR 26/7 1,000-Ft Span	795-MCM ACSR 54/7 1,000-Ft Span	795-MCM All-Aluminum 37 Strand 600-Ft Span	795-MCM All-Aluminum 37 Strand 1,200-Ft Span	795-MCM All-Aluminum 37 Strand 1,200-Ft Span	477-MCM ACSR 18/1 600-Ft Span	336-MCM ACSR 30/7 1,200-Ft Span
1. Maximum Design Tension with NESC Heavy Loading—lb	12,480 (40%)	8,000 (25.6%)	10,000 (35)	6,885 (50%)	6,885 (50%)	.....	6,160 (50%)	8,520 (50%)
Initial Sag on 60F—ft	*21.3	*38.6	*27.6	*12.0	*37.2	.....	*9.2	*25.8
Final Sag at 60F After Maximum Design Loading—ft	23.6	39.6	29.8	13.8	39.0	.....	11.0	29.7
Sag at 60F After 10 Years Due to Creep—ft	24.2	39.6	29.9	14.3	39.6	.....	11.2	29.1
2. Maximum Design Tension with NESC Light Loading—lb	8,725 (28%)	5,080 (16.3%)	6,725 (23.6%)	4,590 (33.4%)	3,850 (28%)	5,400 (39.3%)	4,150 (33.7%)	5,200 (30.5%)
Initial Sag at 60F—ft	*21.3	*38.6	*27.6	*12.0	*37.2	**25.2	*9.2	*25.8
Final Sag at 60F After Maximum Design Loading—ft	22.1	38.8	28.3	12.7	37.6	26.3	9.8	26.8
Sag at 60F After 10 Years Due to Creep—ft	24.2	39.6	29.9	14.3	39.6	29.3	11.2	29.1

* Same initial stringing sags used for both heavy and light loading
** Initial sag at 60F resulting from assumption of final bare tension at 30F equal to 25% of ultimate strength

# of Creep

varies with conductor sizes and materials. Creep curves from tension tests on 795-MCM ACSR 54/7 are in Fig 1 for room temperature conditions. On a log-log scale, a linear relation is obtained for each tension, permitting a reasonable prediction of the creep during the life of a transmission conductor.

Creep rate varies with tension and time. The greater the tension the faster the creep. The rate is greatest when the load is first applied and decreases with time, except that at very high tensions after an extended period the rate may increase and cause stress rupture.

Effect of time on creep is shown in Fig. 2. These are stress-strain curves for 795-MCM ACSR on which creep for different periods, as determined from Fig. 1, have been added. Curves for longer than 10 years are not shown.

These curves are a tool for calculating sags and tensions for 795-MCM ACSR, taking creep into consideration. A simple application of the curves is shown in Fig 3, for an 800-ft span and an installation sag of 10.2 ft at 70F, represented by point A. When temperature is assumed constant at 70F, the conductor stretches along the tension curve to a location corresponding to point B on the sag curve in 1 hr, to C in 24 hr, to D after one month, etc.

Table I compares sag after creep for ten years at an average temperature of 60F with a 60F final sag resulting from non-elastic elongation produced by an assumed maximum

(*Continued on page* 58)

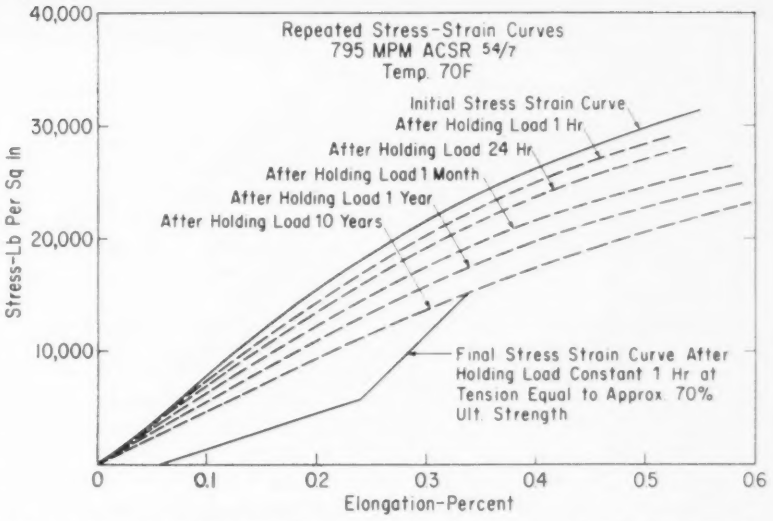


FIG 2—STRESS-STRAIN CURVES show creep for different periods of time for 795-MCM ACSR, as determined from Fig 1. The curves cover up to 10 years

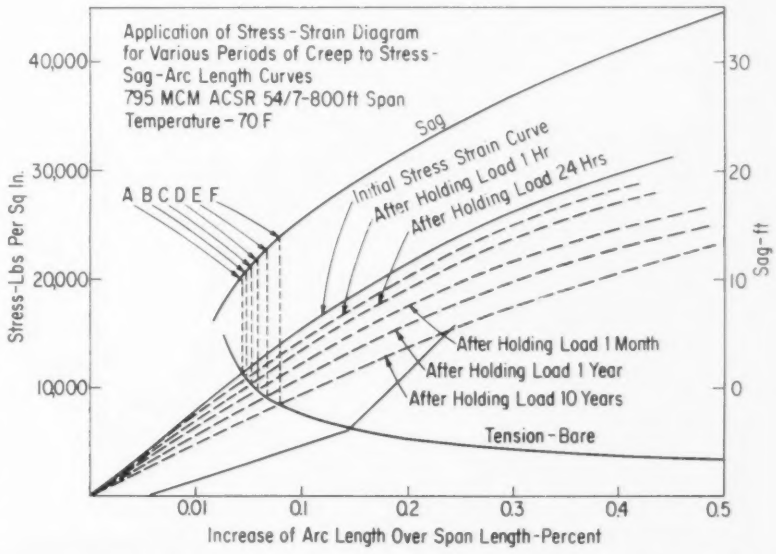


FIG 3—APPLICATION OF CURVES shows that sag after 10 years (point F) is is 3.7 ft greater than initial sag (point A) for 800-ft span at 70F temperature

Creep Lengthens Sag by 2 Ft

Louisiana Power & Light proves out 10-year creep theory before bundling a 115-kv line, avoids construction problem

W. L. RUSH, Transmission & Distribution Engineer, Louisiana Power & Light Co, New Orleans, La.

Louisiana Power & Light Co has confirmed the 10-year creep theory for overhead transmission conductors. By finding 2-ft more sag in a 115-kv line than anticipated, trouble was avoided during the bundling of that line. Now, conductors will be installed to initial rather than final sag—even after prestressing.

The effects of creep were found in a 12-mile line between Sterlington steam plant and Bastrop substation. This 115-kv line has 336.4-MCM ASCR 26/7 conductors and 600-ft spans. Built on H-frame in

(*Continued on page* 58)

How to Gauge Effect of Creep

(Continued from page 57)

tension. These values for ACSR and all-aluminum under various conditions show that creep in heavy loading areas produces final sags approximating the final sag after maximum loading.

In lighter loading areas, normal tensions are usually higher and spans longer. Both factors tend to increase the effect of creep. Maximum design tensions are generally lower than in heavier loading areas, and non-elastic extension from maximum loading is less. Thus, creep is usually the predominating factor in light loading areas.

Allowance is made for creep when preparing Alcoa sag charts and tables for light loading areas. In other areas, creep is also considered and allowed for, if necessary.

In the past, the amount of creep assumed for calculations was based on holding maximum loading for certain periods in the different loading areas. Although this was generally satisfactory, a realistic approach is now used. Allowance for creep is made by calculating the non-elastic elongation from the initial tension at 60F for ten years, assuming average temperature is 60F.

These data are based on laboratory tests at room temperatures, and many findings have been proved on outdoor spans within usual temperatures.

Creep Lengthens Sag by 2 Ft

(Continued from page 57)

1947, it endured three bad ice storms.

During construction, conductors were prestressed to test the anchors, because of the doubtful holding quality of the soil. Conductors were installed at final sag. To provide a margin of safety, the clearance was based on 120F instead of 60F, as called for in the code.

Plans for building the line anticipated that the new conductor would be prestressed and installed 9 in. below the full length of the existing one. But after hearing the late George H. Phillips' paper (see preceding page), company engineers decided to recheck clearance before bundling the line.

The line's service record nearly matched the conditions cited by Phillips. A check of conductor sag in 15 places revealed 2 ft greater sag than when installed, confirming the 10-year creep theory.

In view of this finding another construction step was added to construction procedure. The new procedure is:

1. Install the new suspension clamp 9 in. below the existing one.

2. String the new conductor and prestress it.

3. Sag the new conductor in the lower clamps to *initial* sag instead of 9 in. below the existing one. At mid-span the new conductor was above the existing one.

4. Interchange the positions of the two conductors by installing the new conductor in the top suspension clamp and the existing conductor in the lower one. This easy operation did not increase the contract price for wire stringing. The final step provided a conductor spacing of 9 in. at each suspension clamp and 2 ft 9 in. at mid-spans, instead of a uniform 9 in. and after 10 years the spacing should be uniform due to the creep.

As a consequence of its experience with conductor creep, the company has since changed its new-construction practices. Conductors henceforth will still be prestressed, but they will then be installed to initial rather than final sag.

Louisiana Power & Light did not encounter trouble with creep during the bundling of two other transmission lines (EW, Oct. 4, 1954, p. 68, and Dec. 12, 1955, p. 102). This apparent freedom from creep troubles was due to the fact that the existing conductors were relatively new and had not been subjected to the same loading from ice.

Aluminum

Use of aluminum reduces maintenance without materially increasing capital costs

W. S. EINWECHTER, Engineer in Charge of Substation Design,
R. R. GLOVER, Structural Engineer, Philadelphia Electric Co, Philadelphia, Pa.

Aluminum is being used for structural members to support a tubular aluminum bus, disconnecting switches, potential devices, and lightning arresters at four Philadelphia Electric Co bulk power and high voltage substations. The substations operate at 132, 66 and 33 kv.

For some time, Philadelphia Electric outdoor substations have used welded aluminum tubing as the bus conductor. But two-pipe steel structures, concrete-filled, supported the insulators and other equipment, supplanting an earlier open lattice design. First cost of the pipe structure was practically the same as the lattice, but ease of painting brought a sharp reduction in overall maintenance costs.

An investigation indicated that use of structural aluminum might further reduce maintenance costs without materially increasing capital investment. Designs were developed by Philadelphia Electric Co personnel with assistance of Aluminum Co of America. A high strength structural aluminum alloy (type 6061-T6) was selected.

Use of rigid tubular bus and misalignment tolerances of disconnecting switches dictate the amount of stiffness that must be designed into the structures. Because aluminum has about one-third the modulus of elasticity of steel, direct substitution of members could not be made. Required deflection limits are met by using a square cross section, instead of round pipe, to increase the moment of inertia and reduce deflection in vertical members.

Because extruded or rolled sections were not available at the time in the size required, vertical members were fabricated from aluminum plate, bent and welded to form a square cross section. Standard struc-

Structures Support Aluminum Bus

tural shapes form the top or bridge members, which are welded to the supports to form an all-welded supporting structure.

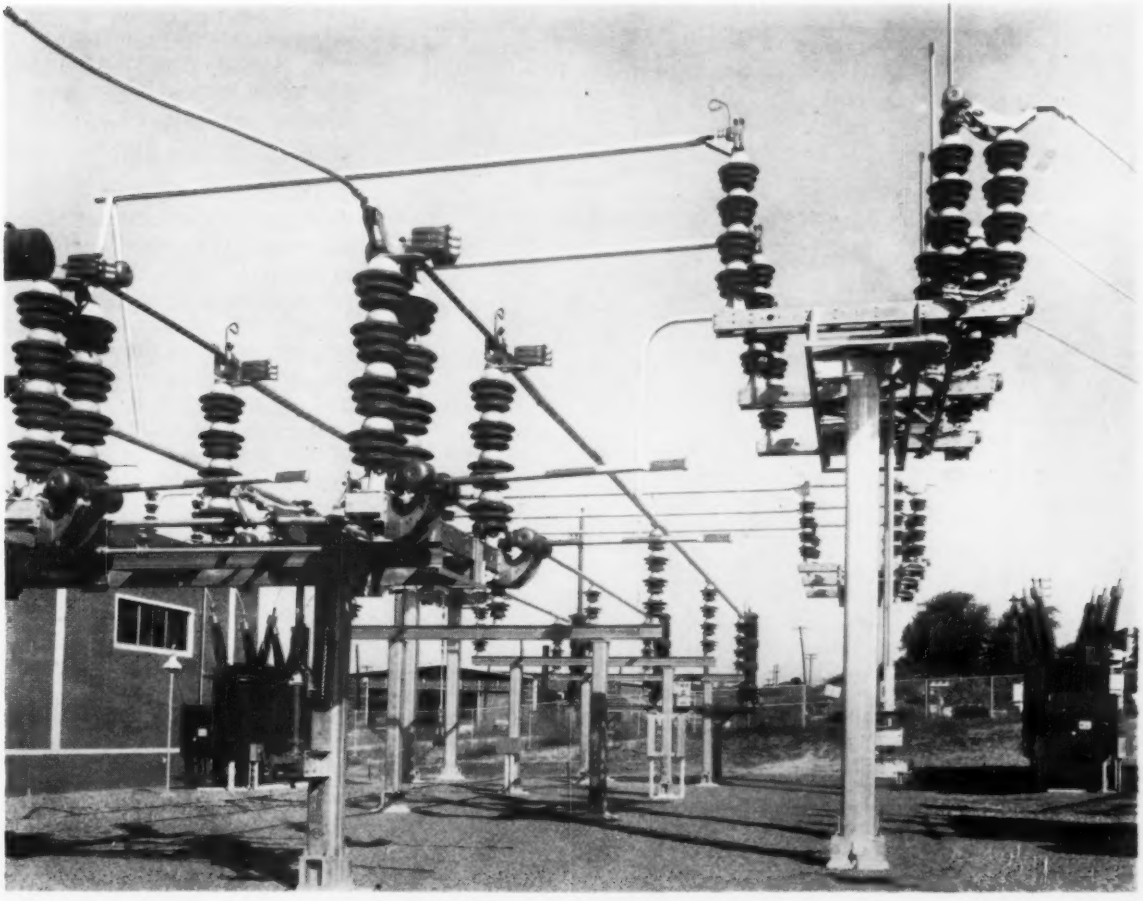
Although the fabricated cost of the aluminum structure is slightly higher than that of steel, savings in erection, grounding, and maintenance result in a total cost favoring aluminum. Reduced weight and corresponding ease of handling, absence of the need to fill vertical members with concrete to prevent internal corrosion, and elimination of painting are primarily responsible for the savings in erection cost. Erection time is reduced by about 25%.

Supported equipment is grounded to the aluminum structure. Because aluminum is an acceptable nonmagnetic conductor, a connection of the base of the aluminum structure to the ground network completes the electrical connection between equipment and ground. The grounding connection between the aluminum structure base and the copper ground network is welded.

The bases of vertical members are bolted to concrete foundations with No. 304 stainless steel bolts and flat washers at the four corners. The bottom of the aluminum is coated with a bituminous compound to prevent initial corrosion, because grout is placed between the foundation and the structure for leveling and alignment. Oxidation-inhibiting grease is applied to the top of the bolt, nut and washer to prevent electrolytic action between dissimilar metals.

Design criteria are based on tubular conductors up to 4 in. in diameter for 132-kv service and 3-phase symmetrical short circuits of 10,000,000 kva. Movement of conductors in any direction has been limited to ¾ in. with ½ in. ice and a 100 mph cross wind. Only two top-member designs are used for a given voltage class; one to support disconnecting switches and the other to support bus insulators.

Electrical conductors and aluminum tubing (type 6063-T6) using an all-welded construction have been standard on the Philadelphia Electric Co system for over five years. Connections from tubing to equipment are generally made with all-aluminum stranded cable welded to the tubing and bolted to the equipment. Bolted connections at the equipment are the only ones in the substations that are not welded.



VERTICAL MEMBERS have square cross section. Tolerance requirements for switches dictate amount of stiffness allowed

Combined Gas-Steam Turbine

As modified to save on piping, arrangement gives better heat rate; applicable even where coal is an economic fuel

IGOR J. KARASSIK, Consulting Engineer, 2nd Manager of Planning, Worthington Corp, Harrison, N. J.

The combined gas-turbine and steam-turbine cycle promises inviting improvements in steam power plant economy today, when the more usual cost-cutting procedures are bringing shrinking returns.

Raising operating pressures and temperatures still brings savings in initial investment per kw and operating costs per kwhr, but the savings are continually diminishing. These costs—the latter geared to improving the heat rate of new plants—are the traditional areas where power plant designers and equipment makers exercise their ingenuity.

Today, improvement in heat rate, *ei,* plant efficiency, is approaching an economic impasse. Although further increments in operating pressure, for instance, can yield still lower heat rates, rising investment costs and the growing complexity of operation threaten to swallow up any further improvement in plant efficiency.

Increasing operating temperatures would afford appreciable efficiency gains through the consequent higher pressures. But the limit of this procedure is reached at the 1,050F level. Very little gain is available beyond 3,500 psi and hardly any above 4,000 psi. Although further gains are available again at higher pressures once 1,200F operating temperatures are used, the steam plant operator is there approaching a relatively little-known territory.

The average steam plant has maintained an average reduction of about 3% per year in fuel consumption per kwhr in recent years. But evidence is mounting that this rate will drop to 2% and even 1% over the next 20 years.

In the typical arrangement of the combined steam-and-gas turbine cycle, shown in Fig 1, air is taken into an air compressor driven by a gas turbine. The discharge from the compressor passes through an air preheater which is supplied with heat from the gas turbine exhaust. The discharge is then delivered under pressure to a pressurized boiler operating at 60 to 80 psig, a pressure level which supports the combustion of gas, oil, or coal.

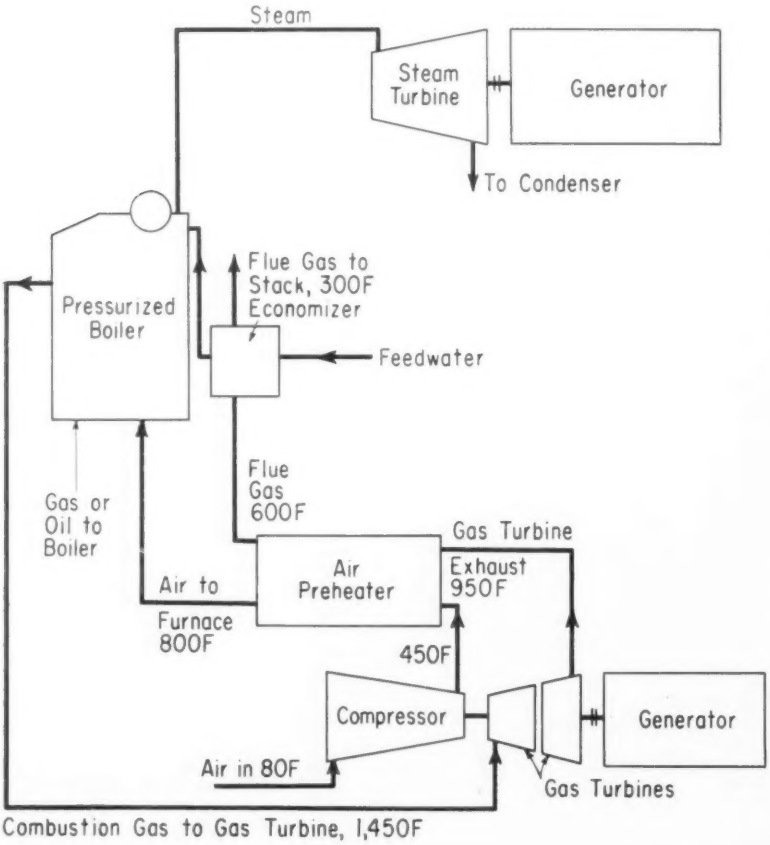


FIG 1—SCHEMATIC shows combined steam-turbine and gas-turbine cycle with pressurized boiler plant. The cycle underwent improvements shown opposite

Show Better Heat Rate

The exhaust gas from the boiler discharges through the gas turbine, air preheater, and feedwater economizer, after which the cooled flue gas is discharged through the stack.

Some of the gas-turbine-generated power drives the air compressor; some, an electric generator. The steam portion of the cycle is conventional, except for the heating of the economizer by exhaust gas from the gas turbine and the pressurized boiler.

Many studies agree in showing the possibility of a very marked improvement in heat rate from this combined steam-and-gas turbine cycle. One study established that where a straight steam unit, operating at 2,000 psi, 1,050F/1,050F reheat, shows a heat rate of slightly over 8,900 Btu/kwhr, a combined steam-and-gas turbine plant with a pressurized boiler, when designed for the same steam conditions, has a heat rate of only 8,400 Btu/kwhr. This performance exceeds that predicted for super-pressure steam plants operating at 4,500 psi with

Cycle Offers Plant Savings

two reheats in the familiar temperature range.

Yet, because of its potentially lower availability, designers have been reluctant to specify large units of the cycle illustrated in Fig 1. Although the reliability of the gas turbine has been improved, this part of the cycle must still earn a reputation for dependability and long life without forced or scheduled outage comparable to the steam turbine's.

There is another obstacle: the coal-burning gas turbine remains beyond the horizon. Where coal is an economical fuel, utilities cannot afford to shift to gas or oil.

Meets Objections

A modified steam-and-gas turbine cycle has been developed, however, to achieve some of the benefits of combining the two cycles, while obviating the forementioned objections. This cycle is based on the premise that the heat rate attainable at 3,500 psi and 1,050F with single reheat can be equaled at 2,600 psi and double reheat at 1,050F/1,050F. Its development indicates that improvements of a major kind are obtainable in a conventional steam cycle by introducing a second reheat for the steam turbine.

Double reheat has not been found practical in conventional steam plants at steam pressures of 1,800 to 2,600 psi. The steam volume to be returned to the boiler at the second reheat pressure becomes so large that the piping to accommodate it makes such an arrangement very uneconomical.

Generally, pressure at the first reheat point is of the order of 25% of the throttle pressure, the second reheat pressure being 20 to 30% of the first. Starting with a 2,400-psig throttle pressure, the first reheat pressure might be 600 psig and the second 150 psig. Were the throttle temperature 1,050F and the reheat temperatures 1,050F also, the specific volume of the steam returned to the turbine second reheat stage from the boiler would be about 16 times that of the throttle steam. This would make steam piping to and from the boiler extremely expensive to install.

But, if the steam did not return to the boiler for the second reheat and a pressurized, separately fired reheater was placed quite close to the steam turbine, piping for the second reheat would be almost completely eliminated. This arrangement is what is proposed in the combined cycle (for which patents have been applied for) illustrated in Fig 2. Its steam portion employs a conventional, non-pressurized boiler which can utilize whatever fuel is locally economical. Until coal-burning gas turbines are available, its second reheater will burn oil or gas.

The gas turbine portion resembles that in Fig 1, except that the discharge from the air compressor is directed to the pressurized reheater for the second steam reheat. The compact reheater can be placed next to the steam turbine to minimize reheat piping. Its major advantage lies in the fact that the gas turbine is not tied up intimately with the generation of steam; it is intended strictly to supply the second reheat. In an outage of the gas-turbine portion, the steam turbine continues to operate. Only the second reheat and the additional capability provided by the gas turbine are lost.

The cycle also justifies the use of a gas turbine where coal is economically preferable to gas or oil, as only a small part of the total fuel requirements must be satisfied by the latter fuels.

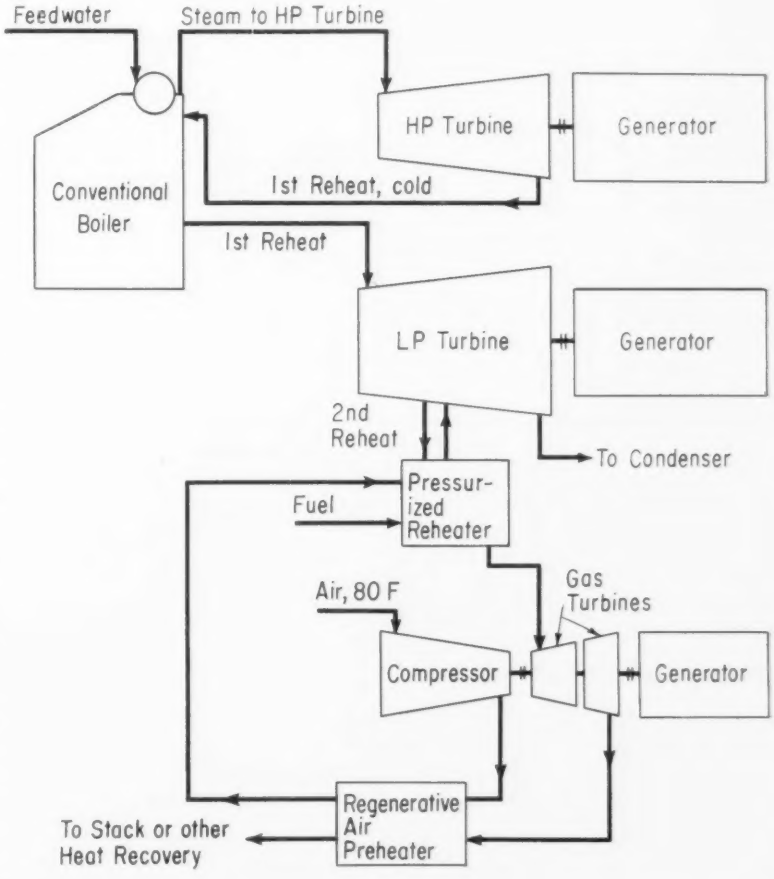
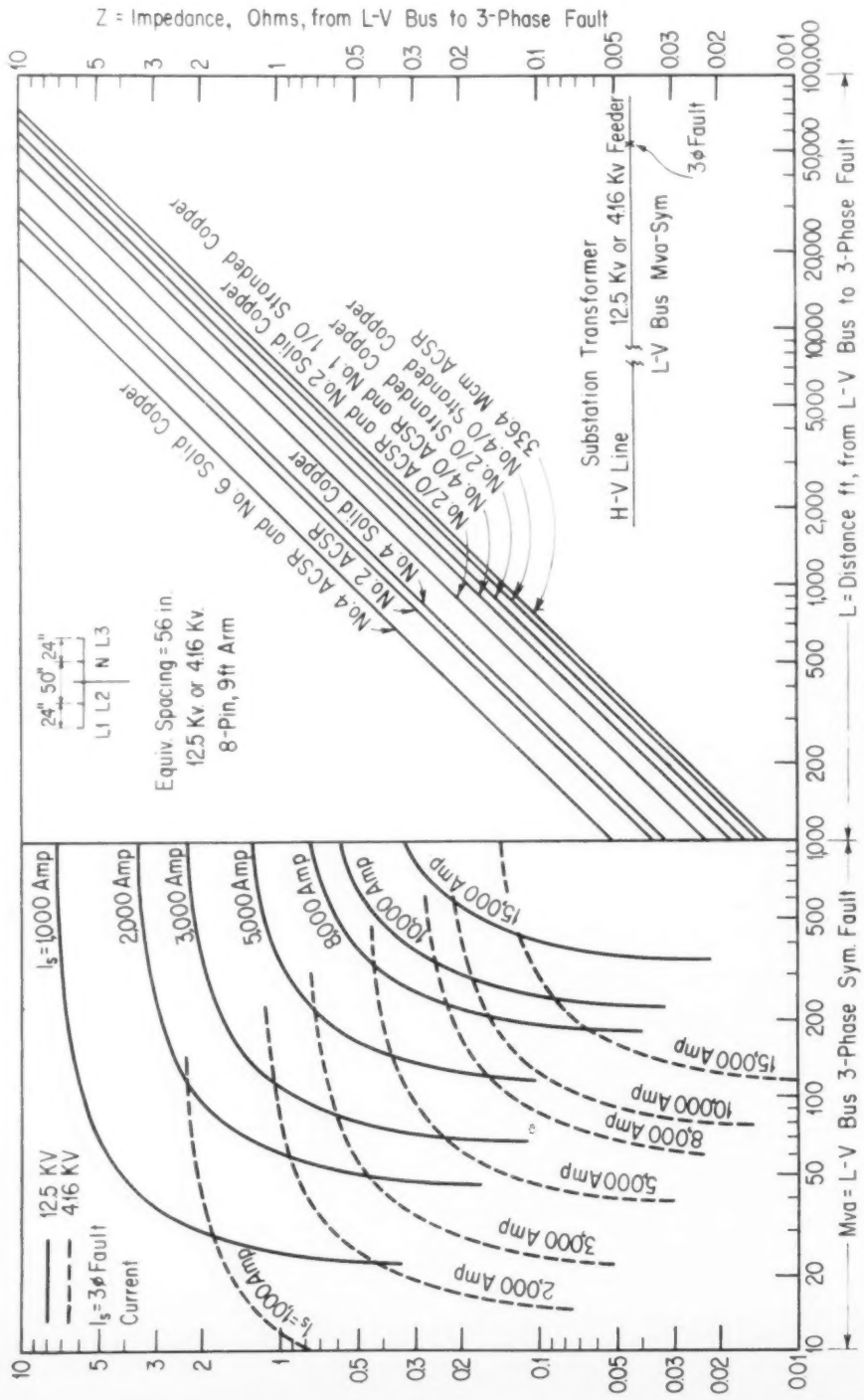


FIG 2—MODIFIED ARRANGEMENT doesn't tie gas turbine intimately with generation of steam. Layout adds second reheat from pressurized reheater

Graph Aids in Locating Protective

JOHN E. MAKOVICH, Associate Engineer, General Engineering Dept, Puget Sound Power & Light Co, Bellevue, Wash.


Z = Impedance, Ohms, from L-V Bus to 3-Phase Fault
Substation Transformer
H-V Line
12.5 Kv or 4.16 Kv Feeder
L-V Bus Mva-Sym
3φ Fault
No. 4 ACSR and No 6 Solid Copper
No. 2 ACSR and No 4 Solid Copper
No. 4 ACSR and No 2 Solid Copper
No. 2/0 ACSR and No 1 1/0 Stranded Copper
No. 4/0 ACSR and No. 1 Solid Copper
No. 2/0 Stranded Copper
No. 4/0 Stranded Copper
336.4 Mcm ACSR Copper
Equiv. Spacing = 56 in.
12.5 Kv or 4.16 Kv.
8'-Pin, 9ft Arm
24" 50" 24"
L1 L2 N L3
L = Distance ft, from L-V Bus to 3-Phase Fault
Mva = L-V Bus 3-Phase Sym. Fault
12.5 KV
4.16 KV
Is = 3φ Fault Current
Is = 1000 Amp
2000 Amp
3000 Amp
5000 Amp
8000 Amp
10,000 Amp
15,000 Amp
2,000 Amp
3,000 Amp
5,000 Amp
8,000 Amp
10,000 Amp
15,000 Amp

Duplex graph is an aid in installation and relocation of cutouts, reclosers, and other protective equipment for normal load growth, or because of the installation of distribution substations in areas of small conductors and limited capacity protective devices.

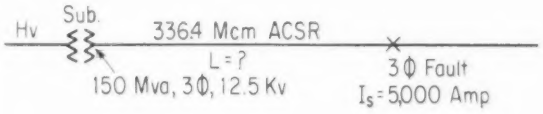
Graph can be used also to specify locations for pole-mounted shunt capacitors where available fault current is not in excess of tank rupture rating. Further use of this graph is to determine adequate conductor size to prevent burndowns.

Three examples illustrate use of the graph to determine approximate distance to fault and amount of current at the fault, for placement of line protective devices.

Devices on Mains and Feeders

Three Applications for Use of the Graph

Problem No. 1



GIVEN—Symmetrical 3-phase fault measured at a substation 12.5-kv bus is 150 Mva. Primary feeder has 336.4-Mcm (Merlin) conductors.

How far from the substation can a 15.5-kv cutout of 5,000-amp interrupting capacity be installed on the feeder without exceeding its interrupting rating.

SOLUTION—Step 1-Locate Mva = 150 on the abscissa of left section of the graph.

Step 2—From this point proceed vertically to intersection with solid curve representing I_s = 5,000 amp. Then continue horizontally to the right to line representing 336.4-Mcm (Merlin) ACSR conductor.

Step 3—Drop vertically and read L = 3,000 ft on the abscissa.

RESULT—3,000 ft is the distance.

Note: If the feeder is other than 336.4-Mcm ACSR conductors, draw the horizontal line in Step 2 to intersect with the line of the desired conductor, then complete Step 3.

Problem No. 2

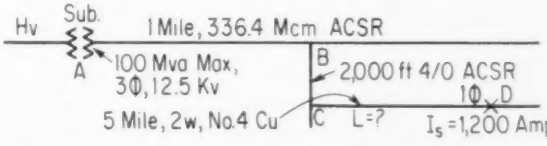
GIVEN—One-line impedance of one-mile, 3-phase, 12.5-kv circuit of 336.4-Mem ACSR and 2,000 ft of 4/0 ACSR conductors (A-B-C) is 1.06 ohms.

From point C, how far out (L) on a 5-mile 2-wire, No. 4 bare conductor, single-phase branch is it safe to install a 1,200-amp IC cutout?

SOLUTION—Since the graph is based on 3-phase fault Mva, direct reading of the single-phase line-to-line fault current can be determined only by converting the 1,200 amp to 3-phase current at desired location for the cutout.

$$I_{3\phi} = \frac{I_{1\phi}}{0.866} = \frac{1200}{0.866} = 1400 \text{ amp}$$

Step 1—Locate Mva = 100 on the graph and proceed vertically to intersect I_s = 1,400 amp curve (solid). Then continue horizontally and read Z = 4.2



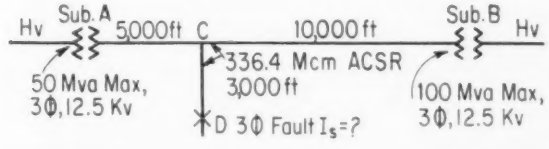
ohms on the ordinate. This is the total one-line impedance from the substation to the location of the cutout. Therefore, the impedance of the No. 4 BC section alone is:

$$4.20 - 1.06 = 3.14 \text{ ohms}$$

Step 2—Locate Z = 3.14 ohms and proceed horizontally to intersect No. 4 solid upper line. From this point, continue vertically up or down and read L = 9,600 ft.

RESULT—9,600 ft is the distance (L = C-D) on the 2-wire, No. 4 bare single-phase line.

Problem No. 3



GIVEN—A 12.5-kv distribution system is supplied by two substations. The 3-phase symmetrical faults on the 12.5-kv bus at substations A and B are 50 and 100 Mva, respectively.

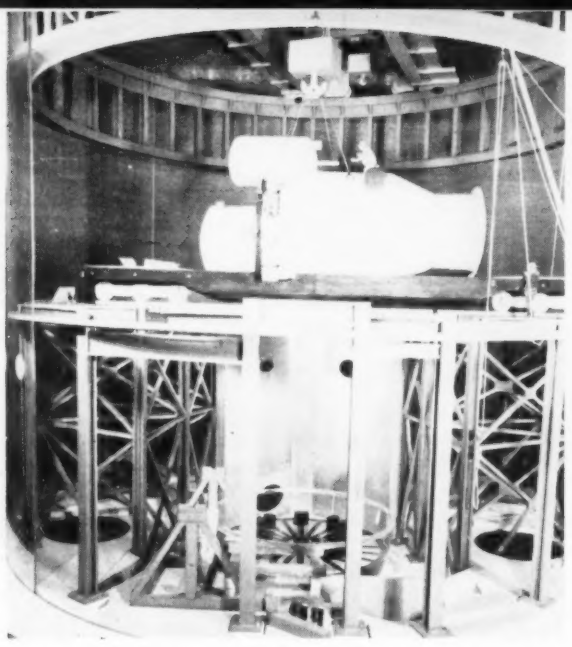
What is the approximate 3-phase fault current at point D. (Assume all 336.4-Mcm ACSR conductors)?

SOLUTION—Step 1—Distance ACD is 8,000 ft—locate L = 8,000 and proceed vertically to intersect the 336.4-Mcm line. From this point, draw a horizontal line to intersect a vertical line drawn from Mva = 50. Intersecting point, by interpolation, reads approximately 1,900 amp. This is the short-circuit current contributed by substation A.

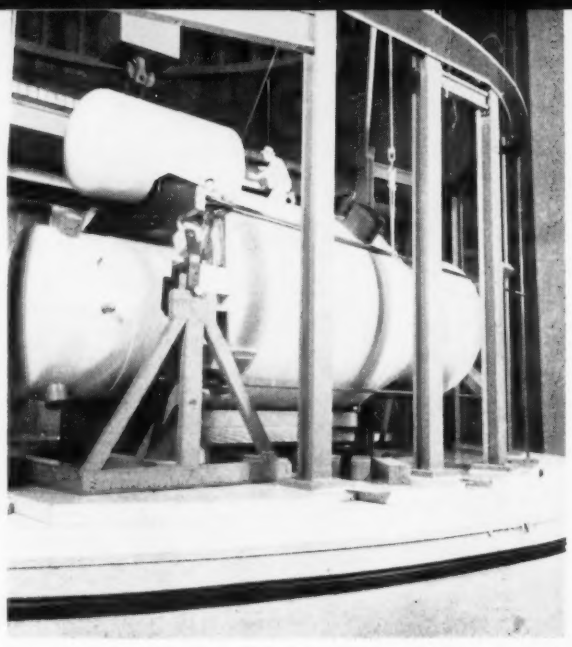
Step 2—Distance BCD is 13,000 ft—follow Step 1 but using L = 13,000 and Mva = 100. Reading is approximately 2,300 amp. This is the short-circuit current contributed by substation B.

Step 3—By superposition, the total is 1,900 + 2,300 = 4,200 amp.

RESULT—4,200 amp is 3-phase fault current at D.



LILLIPUTIAN CRANE lifts model reactor vessel from flat car in preparation for its being lowered into planned position



REACTOR VESSEL is lowered to horizontal frame work, pivot bolts moving into grooves for subsequent movement

Model Checks A-Plant Planning

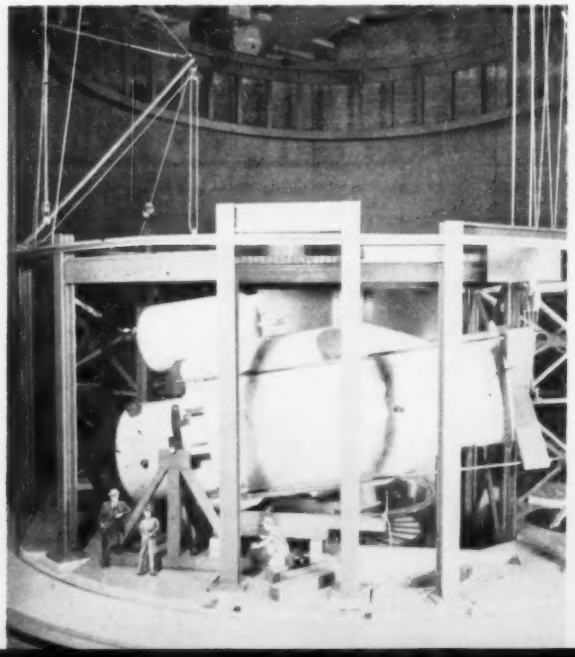
Use of a scale model (1 in. = 1 ft) of the reactor and its building saved probable installment costs and delay by revealing where clearances were insufficient in the plan for the Enrico Fermi atomic power plant. The plant was designed and purchased by Atomic Power Development Associates, Inc.

Working with the model, planners developed the techniques to be followed during actual installation, including the sequence of steps and the handling equipment. They were also able to determine what components could be placed after the reactor was in place.

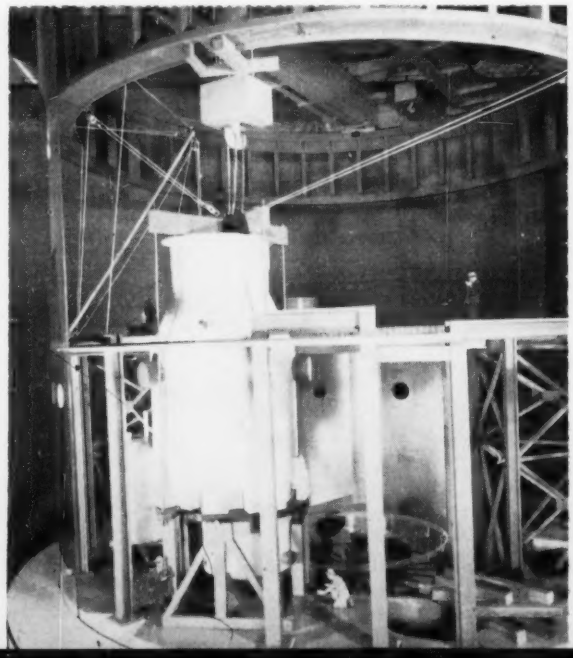
In checking clearances, the planners applied modeling clay to the surfaces of the reactor model, the clay being marked to indicate where clearances were insufficient. In one instance, it was found that the reactor containment equipment would require removal to provide clearance for the reactor itself.

Work with the model revealed also that the crane hook would have to rotate and therefore will have to be power driven.

CRANE lifts reactor vessel towards its final upright position (human figure, lower left, gives installation's scale)

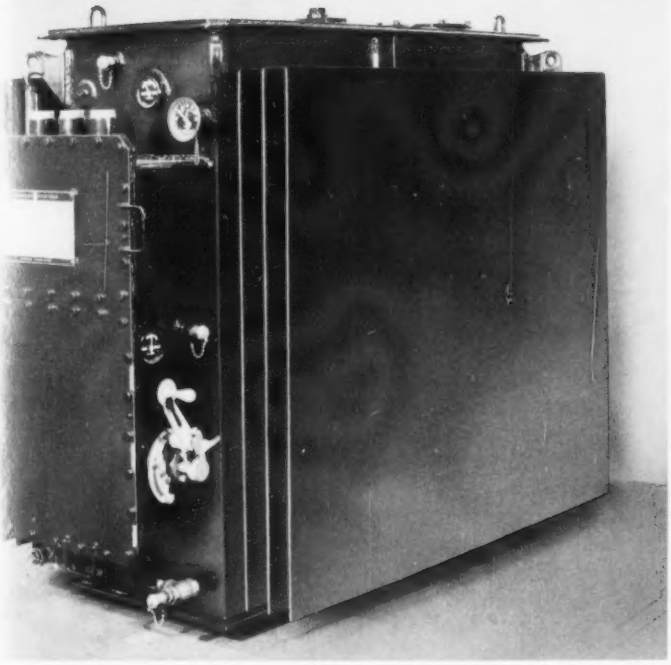


REACTOR in vertical position is ready to be moved into position in shield tank support spider to right and behind unit



DISTRIBUTION

Equipment News



In this issue . . .

- **NEW WELDED LOW-VOLTAGE BUSHINGS** provide hermetic seal on Vaultmaster network transformers

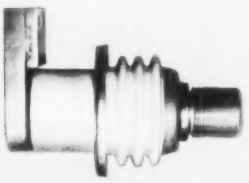
- **NEW SEMI-BURIED TRANSFORMER ENCLOSURES** permit safe, economical use of standard, pole-type units in underground systems

GENERAL ELECTRIC

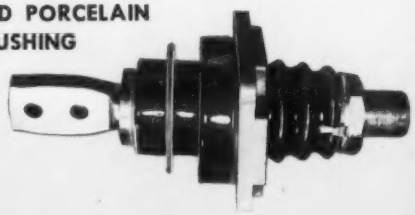
NEW, ALUMINA BUSHINGS welded to the tank inside the L-V throat of a G-E network transformer are shown by design engineer Jerry O'Connell. Transformer is equipped with panel radiators and suspension hooks.

COMPARISON OF NEW ALUMINA AND OLD BUSHINGS			
	PORCELAIN	GLASS	ALUMINA
PHYSICAL STRENGTH			
Tensile	3000–8000 psi	4000 psi	26500 psi
Compressive	25000–50000 psi	90000–120000 psi	285000 psi
Flexural	9000–15000 psi	15000–36000 psi	43500 psi
DIELECTRIC STRENGTH	220 VOLTS/MIL	240 VOLTS/MIL	250 VOLTS/MIL
LENGTH			
1½" Stud	13 inches	12 $\frac{12}{16}$ inches	7⅛ inches
2" Stud	14⅜" inches	17 $\frac{5}{16}$ inches	9 $\frac{3}{32}$ inches

NEW
WELDED ALUMINA BUSHING



OLD
CLAMPED PORCELAIN BUSHING



New Welded Bushings on G-E Network Transformers

Hermetically sealed L-V alumina bushings cut maintenance costs, simplify installation

OMPLETELY NEW LOW-VOLTAGE BUSHINGS for network transrmers—made of alumina instead of porcelain or glass—are now sed on G-E Vaultmaster transformers. The new bushings offer big vings in maintenance costs because of improved sealing. They also mplify installation by reducing over-all height.

REDUCED MAINTENANCE COSTS

ew alumina bushings practically eliminate maintenance troubles used by leaky L-V bushings. The bushings are welded to the tank, stead of clamped, bringing the new G-E units a step closer to the al of a hermetically sealed network transformer.

SIMPLIFIED INSTALLATION

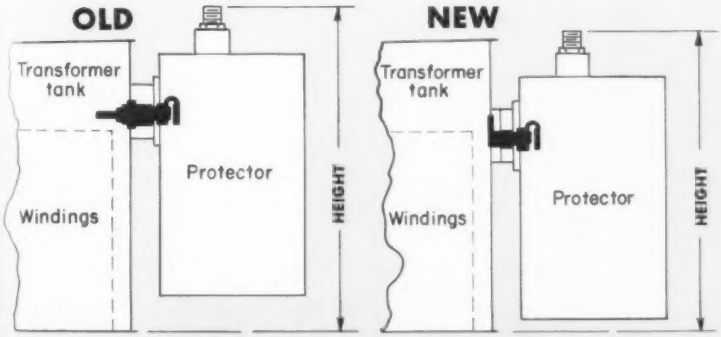
ew alumina bushings simplify installation by allowing more room make cabling connections. Since alumina bushings are shorter than he old types, they are contained entirely within the transformer hroat. The throat can thus be lowered, reducing the height of the ransformer-protector combination.

SIMPLE CONSTRUCTION

metal coating is fired on the alumina shell, permitting a special lloy steel cap and a mounting ring to be brazed directly to the lumina. In assembling the bushing, the cap is welded to the conductor tud. The bushing is mounted by welding the mounting ring to an nsert in the tank wall. Inert arc welding is used for all sealing.

Progress Is Our Most Important Product

GENERAL ELECTRIC



HEIGHT OF PROTECTOR STUD ABOVE FLOOR			
KVA	OLD	KVA	NEW
500	57 inches	500	54 inches
750	70 inches	750	66 inches
1000	75 inches	1000	70 inches

Welded Bushings Bring Vaultmaster One Step Closer to the Ideal Transformer

HAROLD BRUNTON, JR.

Manager—Network Transformer Sales

For many years, there has been a slow but steady trend toward hermetically sealed network transformers. The trend is understandable in view of the fact that a completely sealed unit is less susceptible to leakage troubles and has less chance of inhaling moisture or other contaminants.

The first big steps were taken around 1940. We welded on the tank cover and switch box and devised a way of eliminating gaskets around the thermometer.

The high-voltage end was the next area to be sealed. Wipe entrances were welded to the terminal chamber. It also became possible to weld on the covers for the high-voltage terminal chamber and switch compartment.

When the welded-on magnetic liquid level gage was perfected, just two openings remained into the network transformer. They were the gasketed low-voltage bushings and the high-voltage switch handle (which is effectively sealed with a packing gland).

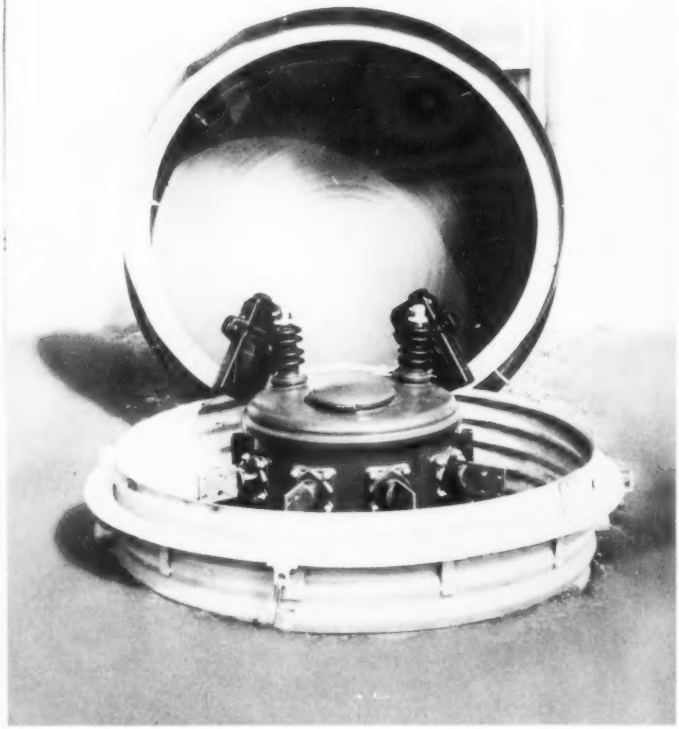
In 1945 we had started supplying solder-seal glass bushings on a limited basis. Since then, glass bushing use had been improved with a change to brazing and just recently, a change to a welded construction. However, we have always wanted a mechanically stronger material than glass. Alumina bushings proved to be the answer.

Alumina is a very hard, shock-resistant ceramic, composed primarily of aluminum oxide (Al_2O_3). It was introduced several years ago on our hermetically sealed pulse and radar transformers. As shown by the comparison table at left, alumina characteristics are superior and our experience with them has been excellent.

Welded alumina bushings are also shorter than previous types. We could use this reduction in one of two ways—shorten the over-all transformer length or reduce the height over the network protector stud. After careful deliberation, we chose the latter because we felt the height was a more critical dimension. Also, we wanted to maintain the working clearance established by EEI-NEMA between transformer tank and protector.

The use of welded alumina bushings brings our standard Vaultmaster units a step closer to the ideal of a hermetically sealed transformer. We anticipate the day when "welded" low-voltage bushings will become standard industry construction.

New G-E Semi-buried Transformer Enclosure Permits Safe, Economical Underground Distribution



NEW G-E ENCLOSURE allows plenty of room for transformer installation and connection. Unit above contains a General Electric 167-kva transformer plus two General Electric cutouts with disconnect blades.

The new G-E semi-buried distribution transformer enclosure provides a safe and economical method of supplying power to modern pole-free residential developments.

The new enclosure easily accommodates pole-type transformers through 167 kva, with plenty of room left for adding disconnects. Thus, linemen experienced in overhead system practices can easily make connections. G-E semi-buried installation can also be easily uprated by merely replacing the transformer.

The 54-inch diameter enclosure is designed for mounting on 48-inch corrugated culvert pipe. The hinged cover projects only 33 inches above ground.

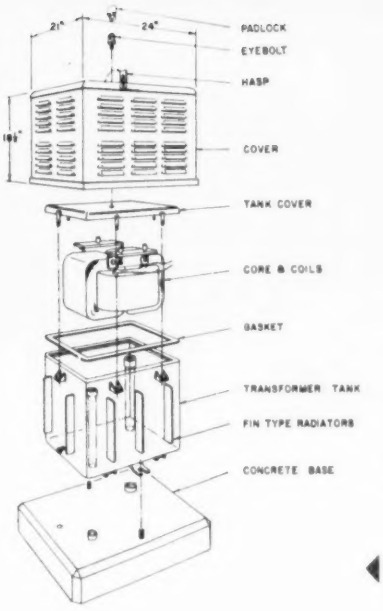
Vent openings are completely baffled for safety of children and for the protection of the transformer against small animals. The all-steel enclosure easily withstands the rigors of field installation.

ADDITIONAL INFORMATION

For additional information on General Electric semi-buried transformer enclosures, contact your nearest General Electric Apparatus Sales Office, or write to General Electric Co., Section 431-84, Schenectady 5, N. Y., for bulletin GEA-6857, "New Semi-buried Transformer Enclosure."

Progress Is Our Most Important Product

GENERAL ELECTRIC



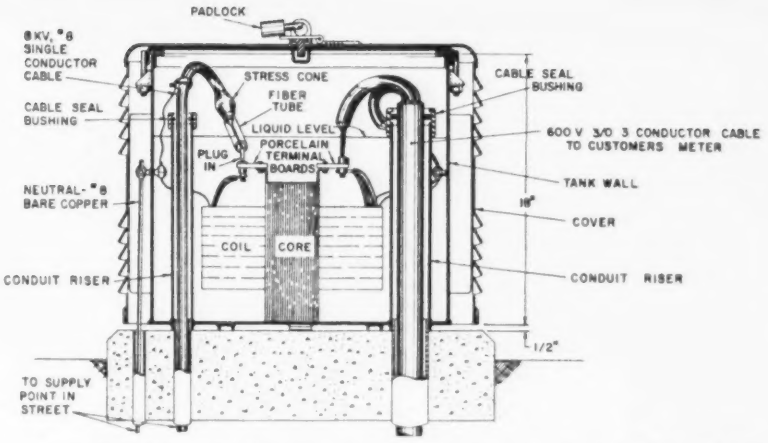


FIG 1—COMPONENTS of specially designed transformer used with buried primary cable for residential distribution are assembled on pre-cast concrete pad

FIG 2—CORE-AND-COIL ASSEMBLY can be replaced to meet load growth. Within tank, open-end conduit risers carry high and low-voltage underground cables

Takes New Load, Costs Less

H. G. HALLY, Engineer in Charge, Transmission & Distribution, Iowa Power & Light Co, Des Moines, Iowa.

First buried primary cable distribution with a transformer for each customer was installed recently on the Iowa Power & Light Co system. The plan is to develop a system for handling future loads with minimum changes. The transformer can be adapted to meet added capacity needs by a simple change of coils.

The transformer has a conventional core-and-coil assembly in a surface-mounted tank, 21 by 24 by 18½ in. Underground high-voltage and low-voltage cables enter the tank's bottom through open-end conduit risers which extend above the oil level. The conduit opening is sealed around the cable by a Neoprene-gasketed cable seal bushing. Internal connections are under oil.

Transformer capacity is changed by changing the core-and-coil assembly. Ratings up to 25 kva can be accommodated by the tank. An outer cover not only padlocks the cover but gives a pleasing appearance. The transformer is on a precast concrete pad and has no taps. Low-voltage protective equipment is omitted, but high-voltage fusing and arrester protection is used where the primary service cable taps the overhead feeder.

To compare costs of serving by this system with serving by a conventional underground system, a distribution layout of a residential development in Des Moines was selected. The costs of serving Customers A and B are compared in the table. Customer A would be served by No. 8, 8-kv cable and the special transformer; Customer B at 120/240 v from a semi-buried transformer vault with No. 3/0, 3-conductor, 600-v cable. The table indicates that the primary service and individual transformer cost $518; the usual secondary cable $580.

Comparison of Estimated Installed Costs

PLAN A

Utilization Transformer		8-KV Cable—200 Ft	
Pre-Fab Concrete Base	$7.50	No. 8, 1/c—8-kv cable at $0.58/ft.	$116.00
Tank and Cover	80.00	No. 8 bare neutral at .02/ft.	4.00
Oil (15 Gal)	8.40		
10 Ft 600v 3/0 Cable	18.00	Total Material	$120.00
		Labor at $0.50/Ft.	100.00
(To Customer's Meter)			
Total Material (Less Core and Coils)	$113.90	Total Cable	$220.00
10 Kva core and coils	143.00		
Total Unit Cost	$256.90		
Labor (installation, wiring)	41.60		
Total	$298.50		

Investment—Plan (A) = $298.50 + $220 = $518.50

PLAN B

Conventional Transformer		600-V Service Cable — 200 Ft	
37½kva, 7,620—120/240	$480.00	3/0, 3C-600-V Cable at 1.80/ft.	$360.00
Prorated to (4) customers = $120/Cust.		Labor at .50/ft.	100.00
		Total Cable	$460.00

Investment—Plan (B) = $120 + $460 = $580

Plastic Pipe Cuts Cable Installation Costs

NICHOLAS FLEISHMANN, Construction Engineer, Patchogue Electric Light Co, Patchogue, N. Y.

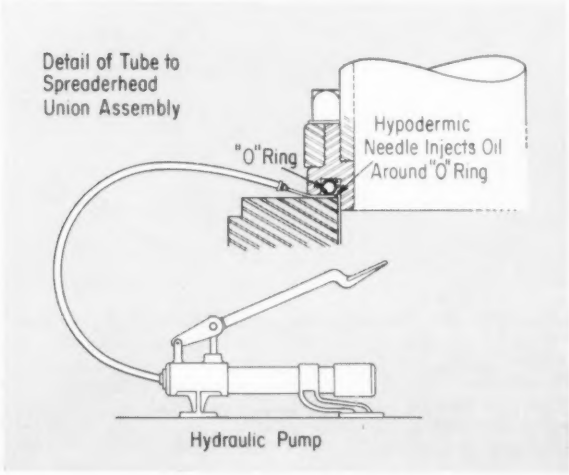
Pipe extruded from a butyrate plastic is used as conduit for street light cable installations by Patchogue (L. I.) Electric Light Co. The plastic pipe is light, tough and corrosion-resistant.

A standard 20-ft section of pipe weighs only 6¾ lb. It is semi-flexible, and obstructions in the conduit trench can often be bypassed by bending the conduit.

During installation, the 1½-in. conduit along with butyrate slip-sleeve couplings is slipped over the two No. 4 insulated and one No. 6 bare copper wires in a 24-in. trench. Joining of conduit lengths is accomplished by applying solvent cement to the couplings and conduit ends with an ordinary paint brush. There is no need for threading as in the case of metal conduit, and a hand-saw may be used to cut the plastic conduit after installation when necessary.

Hypodermic Needle Seals Gas Leaks

R. S. CHRISTOPHER, Asst. Superintendent of Construction, Long Island Lighting Co, Hicksville, N. Y.



A hypodermic needle helps seal leaks on gas filled pipe type cable for Long Island Lighting Co. The needle is used to inject oil under leaking O-ring seal.

Because the gas in the cable may be under several hundred pounds of pressure, the pressure required to force oil through the needle is greater than can be applied by hand. Therefore, the glass portion of the needle is discarded and the needle is silver soldered to a fitting that can be attached to the hose of a hydraulic press capable of 10,000 lb pressure.

With a gas pressure of 200 psig, a pressure of 400 to 500 lb is required to force drops of oil through the needle. A pressure of 2,000 lb is required to squirt a steady stream of oil.

In operation, flange bolts are slacked off on the leaking seals. A clearance of 0.030 in. between the O-ring flange and the surface of the spreader base plate is sufficient to permit insertion of the 0.024-in. needle.

The only alternative method of making repairs would require releasing the nitrogen, raising the riser tube and installing a split O-ring.

(*More Electric Utility Methods on page* 74)

Now over 9 million proved in service

NO FAILURES IN 8 MILLION METERS

proves perfect reliability of magnetic suspension

In over 8 million watthour meters in service, not one of these magnetic suspension systems has ever been replaced because of wear. General Electric's unique magnetic suspension system gives virtually friction-less meter performance by floating the disk and shaft in a magnetic field. This means that in General Electric meters you get the bonus of complete freedom from bearing replacement costs and the bonus of greater sustained accuracy. In fact, after a total registration of 300,000 kilowatt hours under test, meters with magnetic suspension showed no measurable wear, and had substantially greater sustained accuracy than meters with conventional ball bearing systems. These are some of the reasons why General Electric meters give you "service-proved" bonuses in economy and accuracy. Ask your General Electric Apparatus salesman—he'll be glad to show you the proof, or write to your nearest G-E Apparatus Sales Office for information. 628-26

Another Bonus Minimized tilt error

Old Style

Progress Is Our Most Important Product

GENERAL ELECTRIC

When this advertisement appeared in 1958, more than eight million General Electric watthour meters with magnetic suspension were operating without electrical failure. Today—one year and one million meters later—the same high standards of reliability and accuracy characterize G-E meters.

THE MAN WHO HAS TO KNOW . . .
W. E. DUGDALE, PURCHASING AGENT
TELLS WHY . . .

SERVICE pays dividends for Upper Peninsula Power's investment in General Electric Voltage Regulators

"Overnight delivery of a General Electric ML-32 Voltage Regulator from the Chicago warehouse cut outages to a minimum recently after a 3-phase line fault. Consistently prompt G-E service helps us give reliable power to our customers."

General Electric service means the widest and most experienced network of service shops and application engineers available to utilities. G-E service means quick regulator delivery from local warehouses, and rapid repair at local service points—ready for any regulator emergency, seven days a week. And service means complete regulator engineering assistance before, during, and after the order.

G-E REGULATORS COST LESS ON THE LINE because you get continuing extra dividends . . . from **G-E SERVICE**—routine or emergency; from **G-E RESEARCH**—superior regulating equipment; from **G-E DEPENDABILITY**—absolute minimum maintenance. Result: Extra Values—**EXTRA PROFIT.**

Only General Electric returns so much for your regulator investment. Ask your General Electric Regulator Representative to show you how. General Electric Co., Schenectady 5, N. Y.

423-36

Progress Is Our Most Important Product

GENERAL ELECTRIC

Brush Seals Tree Wounds After Trimming

A long-handled brush helps Portland General Electric Co personnel seal tree wounds after trimming. It was designed by George Merz of PGE.

The light-weight brush, supplied with either a 4 or 8-ft extension, has a center feed from a pump reservoir in the base. Triggering the pump supplies a measured amount of sealant to a circular brush at the head through a fiberglass tube. The aluminum-based brush, easily removed for cleaning, is of flexible nylon and can be replaced when worn.

The operator can work from a ladder or platform at the same distance as with long-handled trimming tools. In case of accidental contact between the fiberglass tube and a hot wire, a high degree of protection is provided, as the tubing has very good electrical insulation characteristics.

The reservoir is filled by removing the extension tube and inserting the pump head in the sealant. Retracting the plunger fills the 16-oz reservoir in one continuous operation.

Enclosed Truck Provides Crew Comfort

Crews of San Antonio Public Service Board are taken to and from jobs in personnel carriers, small trucks especially equipped for the purpose. Line trucks haul tools and materials.

A steel enclosure, mounted on a standard panel truck body, provides maximum comfort and protection from the weather. Two panels on each side are hinged at the bottom and can be opened to provide ventilation. Vents on the front with sliding panels also allow air to pass through.

Truck bodies are of the wide-bed type and provide adequate knee room. Seats run across the front and down both sides.

Bitumastic Paint Cuts Footing Rust

A utility in the South is extending life of its old 110-kv steel towers by applying special coatings to the steel grillage footings. The treatment is expected to last 10 years.

The first step is to remove the dirt around the grillage to a depth below the existing rusting. Then the rust is scraped off, and steel members are wire brushed. To prevent further oxidation, the company coats the members with bitumastic paint and wraps the coated area with 15-lb felt to protect it from rocks.

Badly rusted members were replaced. New galvanized steel angles were also treated to extend their lives.

VICTOR SUSPENSIONS

MEAN BUSINESS

VICTOR NO. 900
Suspension Insulator

REDUCTION OF OUTAGES— GOAL OF EVERY POWER MAN

Outages cost money to yourself and your customers. To help reduce outages, VICTOR goes to great lengths. We manufacture and test our suspensions with the industry's most modern equipment. We make them of Purified Porcelain—the toughest insulator porcelain ever made. We make our own glaze to be sure it conforms to VICTOR's high standards. We use premium grade insulator cement to join cap and pin to the shell. We subject them to grueling mechanical and electrical tests far above the required EEI-NEMA values. The result of these "beyond-the-call-of-duty" procedures is an in-built margin of safety that safeguards continuity of service on your lines.

ISOLATION WARD

To maintain the supreme quality of Purified Porcelain, each shipment of clay, flint and feldspar is thoroughly analyzed by VICTOR's ceramic laboratory technicians and then stored in individual bins. From laboratory analysis, the ceramic engineer is then able to compound a mix to conform with the master formula for Purified Porcelain. That is why each insulator is identical with each other — why VICTOR insulators are completely uniform — look alike, perform alike, have the same long service life. It is also a big reason why Purified Porcelain is the finest insulator porcelain ever made!

VICTOR GAVE BIRTH TO AN INDUSTRY— BACK IN 1893

The village of Victor in western New York State (17 miles southeast of Rochester) is the birthplace of wet process high voltage porcelain insulators. Practically all wet process porcelain insulator plants in this hemisphere have sprung directly or indirectly from the plant started in Victor.

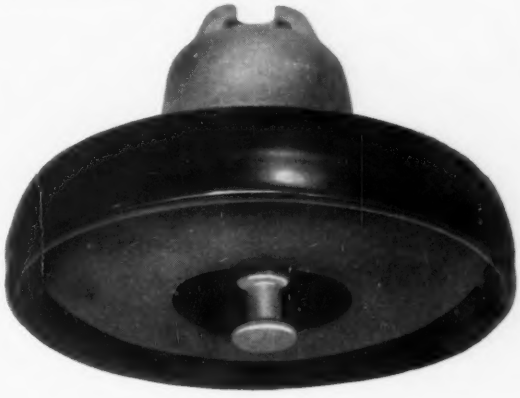
From its beginning, VICTOR has always considered porcelain insulator-making as a science. The men and women who work at VICTOR are true craftsmen. Their duties call for a high degree of skill and knowledge. Today, VICTOR's devotion to the high standards of quality has made possible a perfection and uniformity of product which is the envy of all in the insulator field.

IDEA THAT CLICKED

The insulator business isn't like the automobile business. We don't put out a new line every year. So when a really new insulator design begins to take shape in our engineering department, all of us get a bit excited. We were excited enough when the drawings for the VICTOR NO. 961 FOGBOWL SUSPENSION were ready for the initial factory run. But we are even more excited over the enthusiastic reports we are getting from customers who have put them into service on their lines. Here is a totally different but effective answer to the problem of insulating in areas suffering from the contaminating effects of salt-laden air, fog, smog, chemical or industrial fumes.

For full details and specifications on VICTOR Suspension Insulators write I-T-E Circuit Breaker Company, Victor Insulators Division, Victor, N. Y.

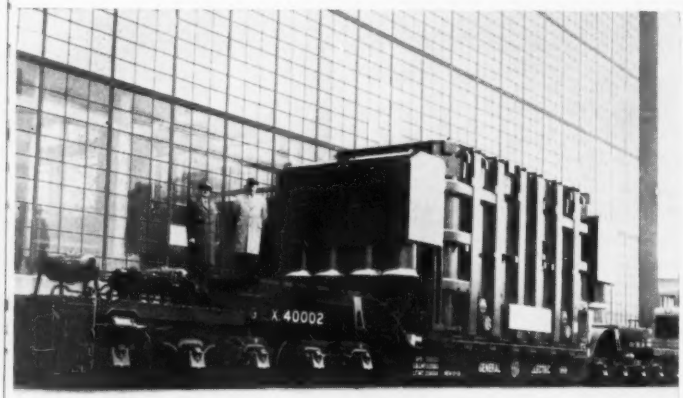
VICTOR NO. 961
Fogbowl Suspension Insulator



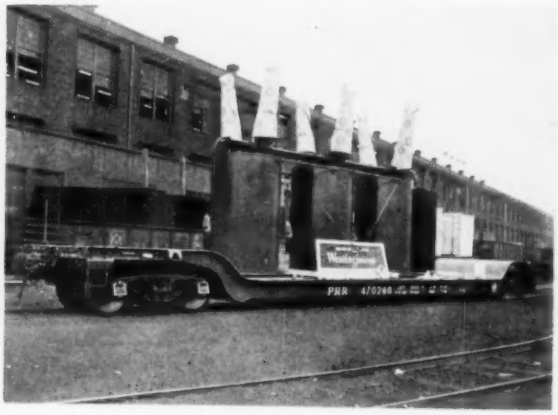
I-T-E

I-T-E CIRCUIT BREAKER COMPANY

VICTOR INSULATORS DIVISION



1 General Electric's 250-ton transformer car



2 Westinghouse uses 20 of these for breakers

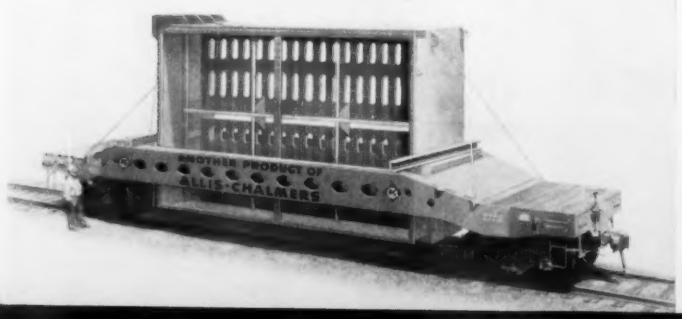
Manufacturers Focus on Railway Car Needs

Larger, heavier electrical apparatus has increased the need for specially designed railway cars. **(1)** General Electric has a 250-ton-capacity car with depressed center for shipping transformers. Car, built by Thall Car Mfgr, is 88 ft long, weighs 240,000 lb and rides on 20 wheels. **(2)** Pa. RR car is one of 20 with 18-inch clearance above rails, designed for Westinghouse breaker shipments. **(3)** Babcock & Wilcox's 460,000-lb steam boiler drum, 103 ft long, 6 ft dia, going to Con Edison, required two special Pa. RR flatcars, with an additional car or "idler" at either end to protect drum over-hang. Drum was mounted on a pair of steel "swivel bolsters" to facilitate transportation on curves. **(4)** Combustion Engineering's 91-ton steel container for Enrico Fermi atomic power plant was barge-shipped and also routed on a C&O RR flat car. **(5)** Allis Chalmers' well-center railroad car carries shell section of a 130,000-sq-ft condenser. Car can take equipment up to 30x18x10 ft. A-C has 2 similar cars.

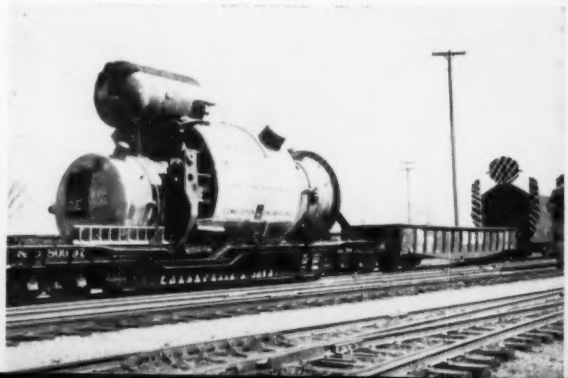
(*More Manufacturers News on page* 81)

3 Babcock & Wilcox's set-up for boiler drum

5 Allis-Chalmer's special condenser car



4 Combustion ships reactor pressure vessel



TEAR OUT AND FILE FOR FUTURE REFERENCE

TEAR OUT AND FILE FOR FUTURE REFERENCE

We invite you to LIFT the curtain as

Pennsylvania Transformer

introduces a new distribution regulator...

Combining . . . for the *first* time . . . 2 outstanding Pennsylvania products:

❶

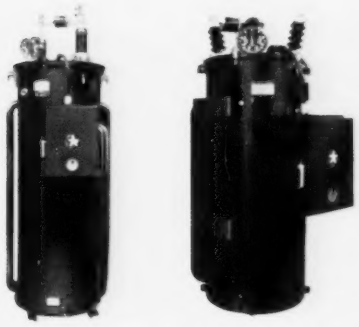
Patented Pole Star distribution transformer—with exclusive lap-on-top core

❷

Pennsylvania's load tap changing mechanism—proved in years of power-transformer service

plus

Mor-Amp feature to increase regulating capacity to 160% of rated current at reduced range



STATION TYPE POLE TYPE

THE POLE STAR REGULATOR

available now in

27 single-phase

distribution ratings

VOLTAGE RATINGS: 2500, 5000, 7620, 13800, 14400

CURRENT RATINGS: 15 THROUGH 668 AMPERES

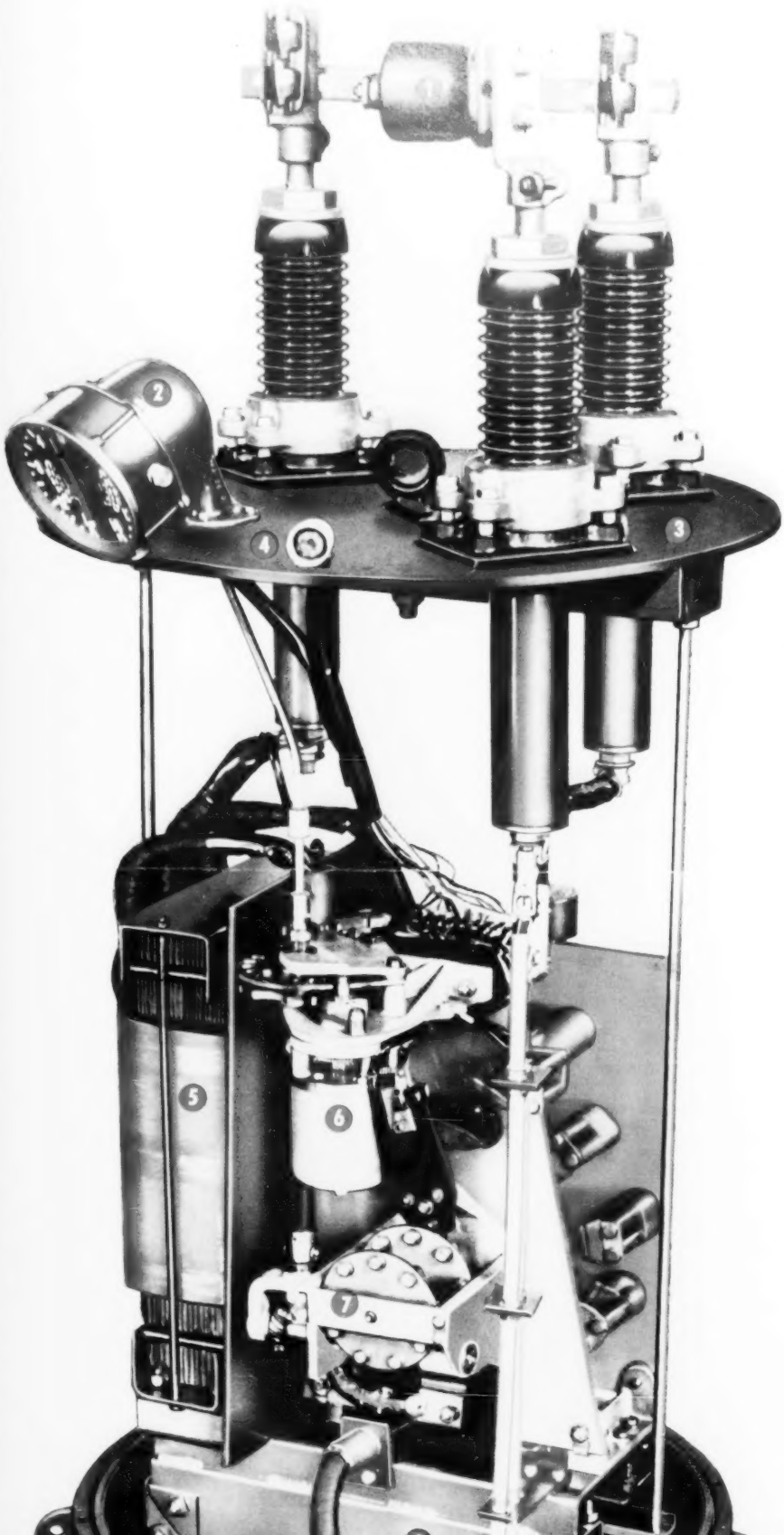
Designed for:
POLE MOUNTING
PLATFORM MOUNTING
STATION INSTALLATION
providing Pole Star reliability

plus

the advantages of efficient, economical voltage regulation in 32 steps of 5/8%

PENNSYLVANIA TRANSFORMER DIVISION
McGRAW-EDISON COMPANY
CANONSBURG, PENNSYLVANIA

TEAR OUT AND FILE FOR FUTURE REFERENCE



... and FEATURES

... story of

the new Pennsylvania Pole Star Regulator ... designed to help your customers *LIVE BETTER ELECTRICALLY*

1. **Lightning protection** for the series winding is provided by a valve-type arrester.

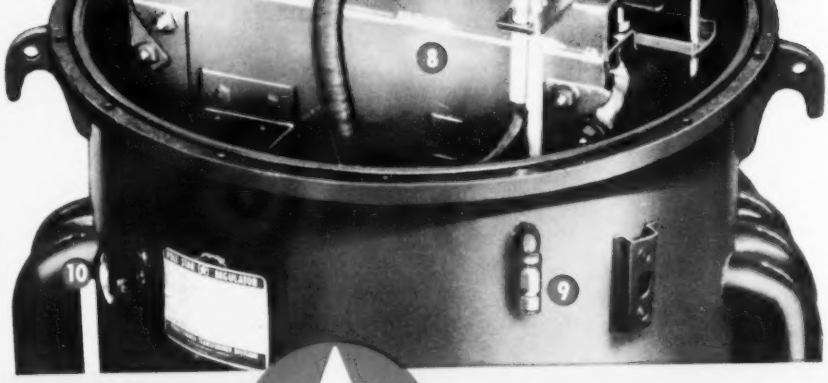
2. **Cover location of position indicator** precludes all possibility of misalignment if unit is untanked for tap changer tests or inspection. Dial is tilted for easy reading.

3. **Unit construction** of internal assembly, cover, and cover accessories greatly simplifies periodic untanking for inspection.

4. **Standard jack plug** on cover connects controls to regulating mechanism. This simplifies relocation of control cabinet.

5. **Bridging reactor** prevents voltage interruptions and dips during tap changes.

6. **Direct-drive tap changing mechanism** gives the Pole Star Regulator many of the service-proved principles of Pennsylvania's power transformer load tap changers. Standard on all Pole Star Regulators rated 13800 and 14400 volts or with current rating from 321 to 668 amperes, the direct-drive tap changer is equipped with a rovers-



668 amperes, the direct-drive tap changer is equipped with a reversible, single-phase, capacitor-type motor.

7. **Positive mechanical interlocking** is assured by direct drive of contacts by means of a scroll cam and index plates. Flat-velocity switch speed reduces arcing and prevents contact erosion.

THE POLE STAR REGULATOR

PENNSYLVANIA POLE STAR REGULATOR
Station-type, with Direct-drive Tap Changer

8. **Pole Star Distribution Transformer core-and-coil assembly** is used in all Pole Star Regulators. This includes patented lap-on-top core, which has established unexcelled records for low exciting current, low core loss, uniform quality.

9. **Screened uni-directional breather** allows for expansion of oil, prevents entrance of moisture or foreign matter.

10. **Oil-level gauge** is standard on all units.

11. **Control cabinet** may be easily removed for relocation at bottom of pole or elsewhere.

12. **Main panel is hinged** for easy access to fuse, arrester, potential transformer.

13. **Easy-to-grip control knobs** save operator's time and temper. Calibrations are large, can be checked at a glance.

14. **Tubes provide high cooling capacity.** Ends are expanded against openings in tank wall to assure tight fit, then are welded inside the tank.

15. **Structural steel base** on station-type units. Pole-type units have hold-down lugs for platform mounting, as well as hanger brackets.

Pole-Type and Station-Type . . .

NEW PENNSYLVANIA POLE STAR REGULATOR offers performance-proved reliability in all single-phase distribution sizes

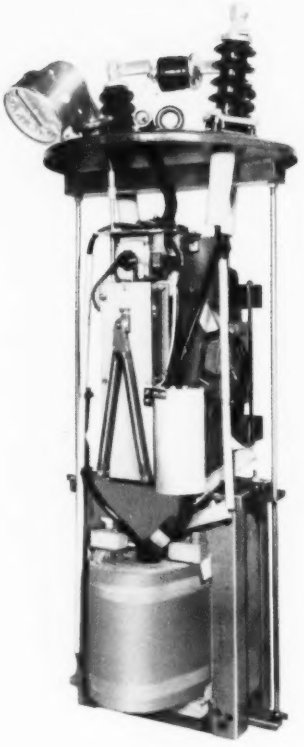
Although new in itself, the single-phase Pole Star Regulator is a product of Pennsylvania Transformer's highly successful, long-term experience in two related fields: distribution transformers and power-transformer load tap changers. As a result, Pennsylvania is able to introduce the Pole Star Regulator in a *complete range of distribution sizes* (a total of 27 different ratings) . . . and with design and construction features that point to economical, sustained performance in *pole-top, platform and station installations.*

10% Regulation in 32 Steps of 5/8%

The features described elsewhere on these pages are yours with the time-proved advantages of 32-step regulation. Voltage is efficiently controlled in 5/8% steps over a range of plus or minus 10%. The normal operating band is plus or minus 1 volt, with a time delay of 10 seconds to avoid unnecessary changes. Both the operating band and time delay can be varied to fit local conditions.

Light in Weight, Easy to Handle

Throughout the entire range of sizes, the Pole Star Regulator offers size and weight advantages that mean easier handling . . . faster, more economical installations. Specific details are given in Bulletin PSR-958. For a copy—or a quotation on your next regulator requirements—write to Pennsylvania Transformer Division, McGraw-Edison Company, Canonsburg, Pa.



POLE STAR

EASY-TO-ADJUST

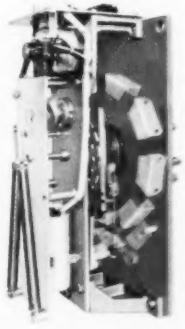
MOR AMP FEATURE

and other convenient controls give maximum flexibility

Controls for the Mor-Amp feature —which permit regulating capacity to be increased to as much as 160% of rated current—are located on each side of the position indicator. Separate scales for "raise" and "lower" Mor-Amp settings are located on the face of the dial.

Mor-Amp is one of many easy-to-use adjustment features that permit wide flexibility in the use of Pole Star Regulators. Voltage level can

be varied from 110 to 140 volts . . . time delay from 10 to 120 seconds . . . operating band from ±¾ to ±6 volts . . . and both reactance compensation and resistance compensation from 0 to 24 volts. Such flexibility, coupled with Pole Star dependability, will help your customers to *live better electrically.*



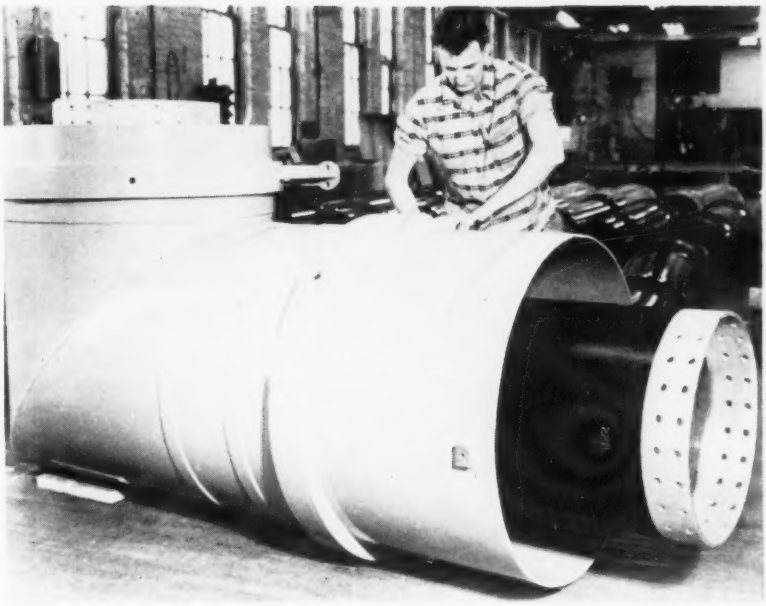
Internal assembly of pole-type Pole Star Regulator with spring-drive tap changer

Design and construction details for the pole-type Pole Star Regulator are essentially the same as for the station-type regulator shown on the inside fold. For units rated 7620 volts and below and with current ratings 320 amperes and below, the high-speed, arc-resisting tap changer shown here is used.

A single-phase, reversible-drive motor loads tension springs that provide energy for the rapid switching action. Tap position is accurately shown by the position indicator at all times, with no chance of misalignment.

PENNSYLVANIA TRANSFORMER DIVISION
McGRAW-EDISON COMPANY
CANONSBURG, PA. • Greater Pittsburgh District

McGRAW EDISON



Isolated Phase Bus to Carry 12,000 Amp

Some 320 ft of this isolated phase bus is slated to carry 12,000 amp—probably the highest current-carrying capacity produced to date. The bus, a 20½-in. round aluminum conductor in a 35-in. non-magnetic aluminum housing, was made by I-T-E Circuit Breaker Co as a power station generator-to-transformer connection.

The manufacturer reports that extensive tests on this size bus indicate that even higher current-carrying capacity bus of this design will present no major heat problem. Both cover and conductor were well within ASA temperature rise standards, said I-T-E, and the bus also surpassed all other mechanical and electrical standards.

End-Welded Studs Hold Boiler Insulation

End-welded studs provide a low-cost method of securing insulation and lagging for high-pressure power plant boilers. Shown here is a recent job at Reeves Station of Public Service Co of New Mexico.

Pressure casing installed over water wall tubes (left) is first seal-welded and tested for leakage. Then stainless steel Setlok studs are end-welded to the casing. Magnesia block insulation and ribbed embossed aluminum lagging are then secured with the studs, which are made by Nelson Stud Welding Div, Gregory Industries, Inc.

(*More Manufacturers News on page* 82)

For "small-job sealing"...

Johns-Manville

Duxseal

in the new handy pocket roll

THE NEW HANDY pocket roll makes Duxseal® ideal for small sealing jobs in both installation and maintenance work. It thereby increases the usefulness of your favorite all-purpose sealing and caulking compound.

The NEW pocket roll container allows quick removal and replacement of the compound. Its ribbon form makes Duxseal easy to apply in any amount, large or small.

3 types of Duxseal are now available in pocket rolls:

- **STANDARD DUXSEAL** is a permanently plastic gray-green compound utilizing a non-drying, vegetable-oil vehicle. It will not corrode metals, plastics, wood, rubber, or painted surfaces. It adheres well to all common materials. It is non-staining.
- **TYPE N DUXSEAL** has the same properties plus higher resistance to bleeding or dripping at high temperatures.
- **R-100 DUXSEAL** employs a resinous material as its vehicle and has the same properties. It skins fast to provide an excellent paint surface.

A wide range of other J-M Sealing Compounds is also available in pocket rolls. These are described in sheet EL-85A. Duxseal is covered in sheet EL-68A. Write Johns-Manville, Box **14**, New York 16, N. Y.

Johns-Manville

DUXSEAL

BIGGEST NEWS YET IN AUTOMATIC LIGHT CONTROL

NEW LUMATROL® MODEL T

Through the years, the unparalleled performance and reliability of Lumatrol Automatic Light Controls has been based on simplicity and quality of design, circuit and components.

Today, Lumatrol Model T is by far the simplest and most reliable of any on the market!

Zenith Sensing!
●
No orientation!
●
No effects from local lighting!
●
Tubeless, of course!

LUMATROL MODEL T IS THE ONLY TUBELESS CONTROL THAT ANSWERS "YES" TO *ALL* IMPORTANT REQUIREMENTS AND SPECIFICATIONS:

- 1800 Watts incandescent lamp load
- Adequate time delay for Mercury Vapor lighting
- Low Power consumption by day
- No power consumption at night
- 8½ ounces total weight
- Full protection against lightning and light transients
- Zenith light sensing
- No orientation
- Simple and rugged
- Case will not crack, craze or discolor in any climate
- Plug-in as proposed in EEI-NEMA specifications
- Two year guarantee against *all* manufacturing defects
- Fail safe

WRITE OR PHONE FOR COMPLETE INFORMATION & SPECIFICATIONS

MANUFACTURED UNDER PATENTS AND PATENTS PENDING BY

MICRO-BALANCING, INC., HERRICKS ROAD, GARDEN CITY PARK, L. I., N.Y. • PI 6-0851

IN CANADA: J. R. KEARNEY CORP. • BOX 270, GUELPH, ONTARIO

20-Mw Gas Turbine Ordered for Peaking

A 20,200-kw gas turbine, largest yet scheduled for service in the U.S., was ordered recently by New Orleans Sewerage & Water Board to firm up base power and meet peak demands. The turbine and the air-cooled, totally enclosed, 23,765-kva, 25-cycle generator will be made by General Electric Co. Shipment is slated for May 1960.

The turbine, specifically engineered by GE for low-cost peak-demand generation, will be adapted from a 16,500-kw, simple-cycle, single-shaft unit. Nine of this type have already been ordered or installed.

The gas turbine's speed of 3,600 rpm will be reduced to 750 rpm by a gear that will be about 7½ ft long and 10 ft wide.

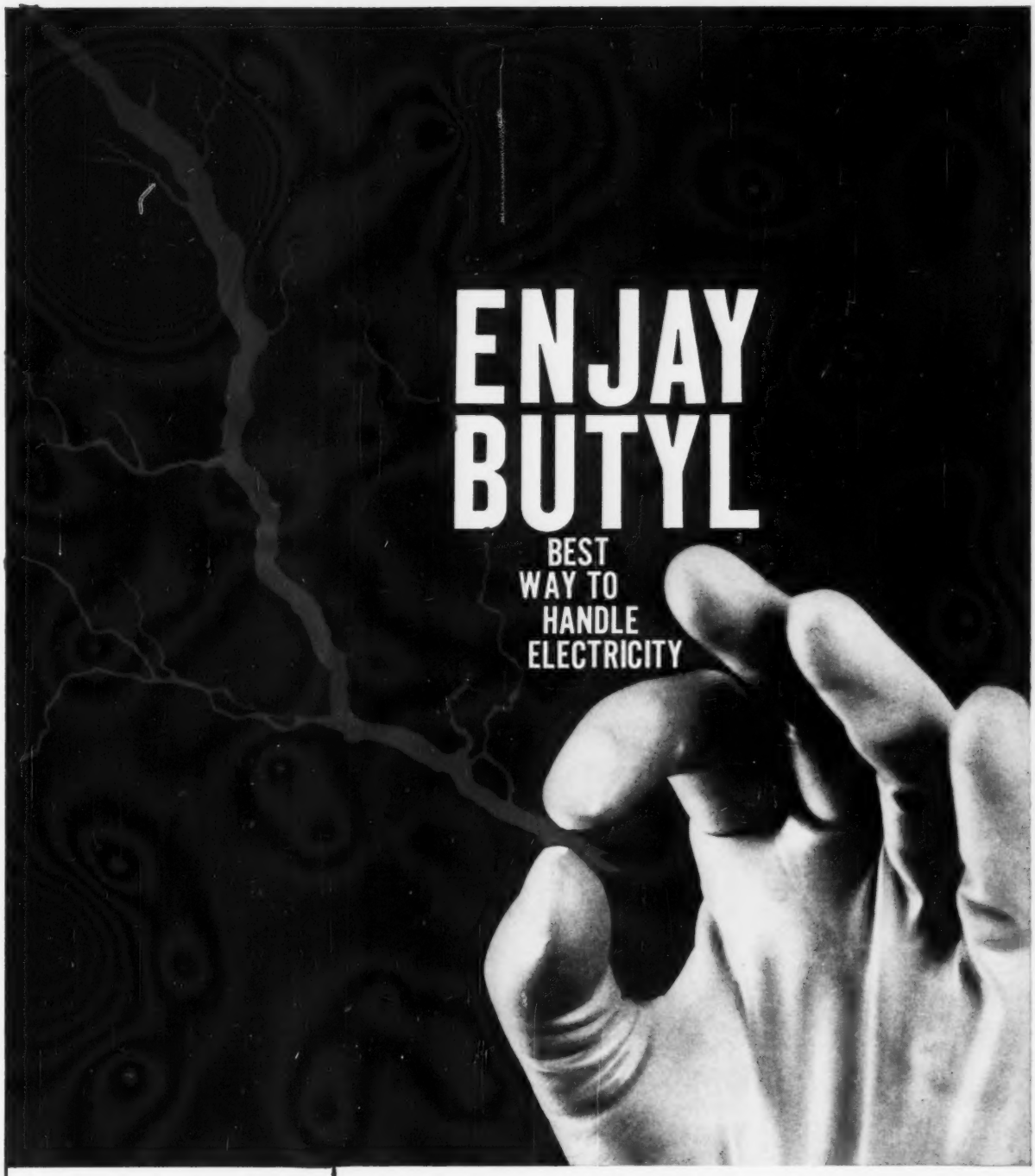
MANUFACTURERS BRIEFS

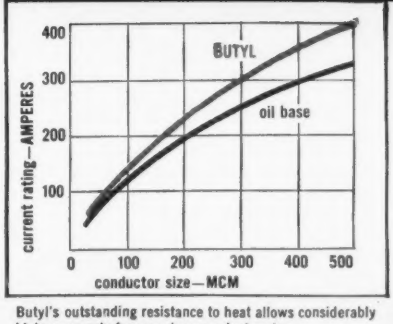
The Aluminum Assn reports record month's production for January, with overall U.S. output up to 156,708 short tons.

RT&E Corp has shipped the first of a new line of transformers designed for underground distribution. It is called the "Terra-Tran."

American Standards Assn has made available the second edition of the International Electro-technical Vocabulary 50 (45)—Lighting. It is the 12th section of the second edition of the Vocabulary completed as separate publication. Price: $4.00. Address: American Standards Assn, PR Dept 44, 70 E 45 St, New York 17, N. Y.

Kaiser Aluminum & Chemical has put on the road two mobile vans for demonstrating the handling of aluminum conduit to electrical groups. Contractors, distributors, utility members will be shown cutting, bending and threading processes for aluminum rigid conduit in standard sizes from ½ inch through 6 inches. Displays feature products of other manufacturers as well as Kaiser's: conduit fittings and accessories made by Thomas & Betts, Burndy, Crouse Hinds and others.





Butyl's outstanding resistance to heat allows considerably higher currents for any given conductor size.

Of all vulcanizable rubbers, Enjay Butyl offers the best electrical and dielectric properties. Butyl is the ideal material for wire and power cable, transformers, tapes, busbars and other insulation applications.

Butyl *also* offers outstanding resistance to weathering and sunlight . . . chemicals . . . abrasion, tear and flexing . . . superior damping properties . . . unmatched impermeability to gases and moisture.

Find out how this versatile rubber can improve your product. Call or write the Enjay Company, today!

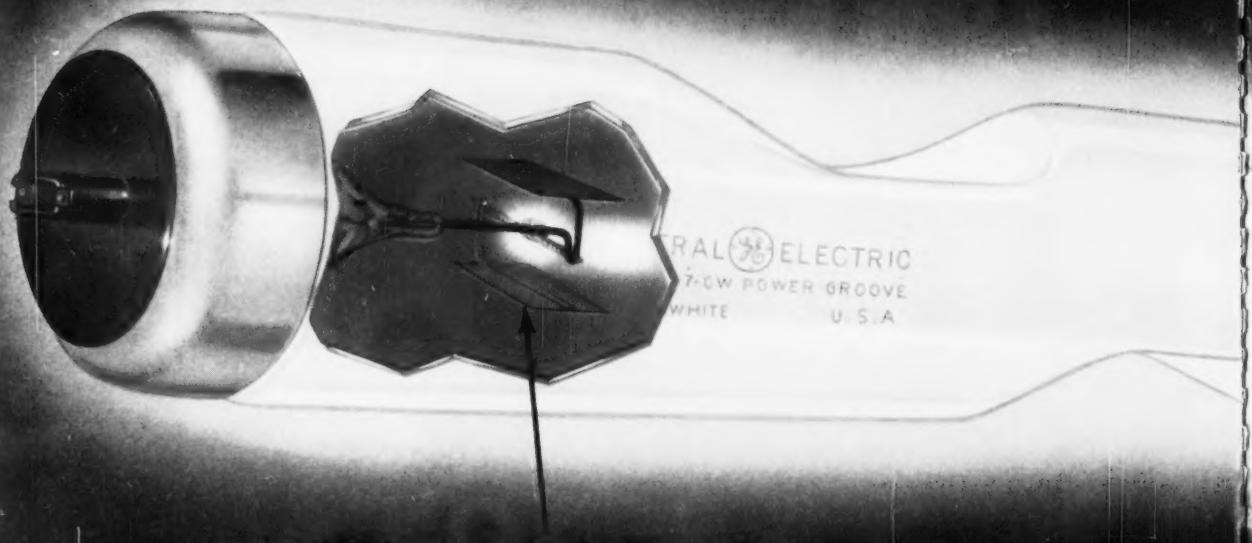
ENJAY® BUTYL

ENJAY *Pioneer in Petrochemicals*

ENJAY COMPANY, INC., 15 West 51st Street, New York 19, N. Y.

Akron • Boston • Charlotte • Chicago • Detroit • Los Angeles • New Orleans • Tulsa

NOW! THE MOST POWERFUL



Cathode shield improves anode action (reducing end loss) and collects tiny electrode particles that would otherwise land on glass wall, darkening end of tube. New G-E Power Groove stays brighter...end-to-end...longer!

NEW G-E POWER GROOVE LAMP...

- Gives most users lowest cost of fluorescent light...
- Saves them 10-30% on initial investment alone
- Stays cleaner, brighter longer—no darkened ends
- Will last about 3 years in single-shift service

The new Power Groove is the most recent advance in lighting from G. E., *your most consistent source for new and improved lamps* to give your customers more for all their lighting costs. If they are planning a new building, or remodeling an existing one, this dramatic improvement in lighting deserves first consideration.

LOWER CAPITAL INVESTMENT. That's the most exciting aspect of this new lamp. It costs no more than the original General Electric Power Groove, yet with all this light you can now plan on—*and deliver*—a higher level of lighting than was ever practical before. And the investment in lamps and distribution equipment is *even more* practical and economical!

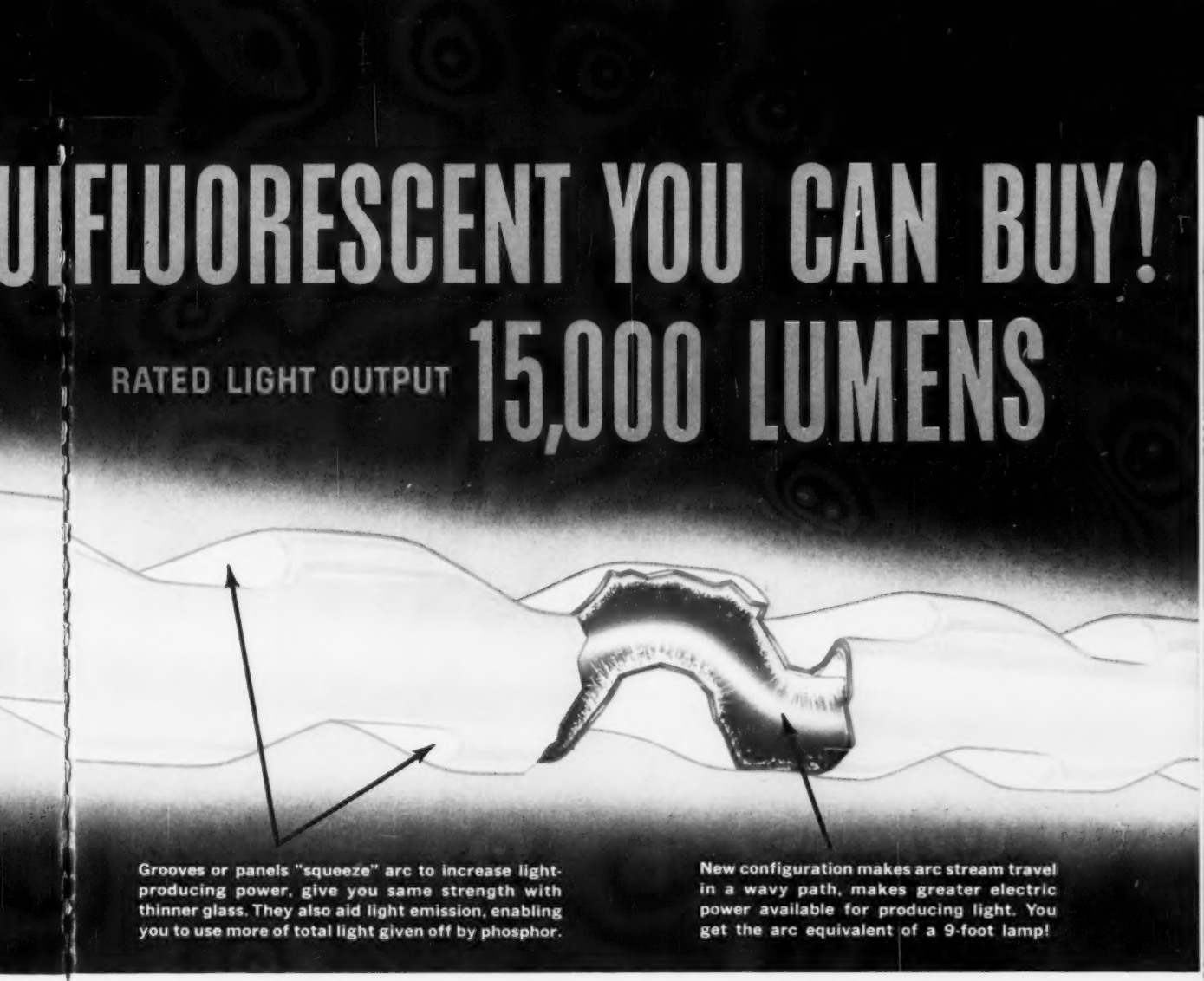
IMAGINE! A single 8-foot G-E Power Groove can deliver a startling 15,000 lumens—the highest light output obtainable from any fluorescent lamp available today. This gives users the lowest cost of fluorescent light for most new lighting systems, and establishes a new set of standards in overall lighting economy.

LIGHT OUTPUT STAYS HIGH. General Electric's efficient cathode shield reduces cathode wattage losses...and also collects the tiny electrode particles that would otherwise be deposited on the glass wall, darkening the lamp ends. General Electric Power Grooves now stay brighter . . . end-to-end . . . longer!

As your customers build or expand, increase your own profits by recommending the economy of the new G-E Power Groove Lamps for their general lighting. For more information, call your nearby G-E Large Lamp Distributor, or write: General Electric Co., Large Lamp Dept. C-913, Nela Park, Cleveland 12, Ohio.

UI FLUORESCENT YOU CAN BUY!

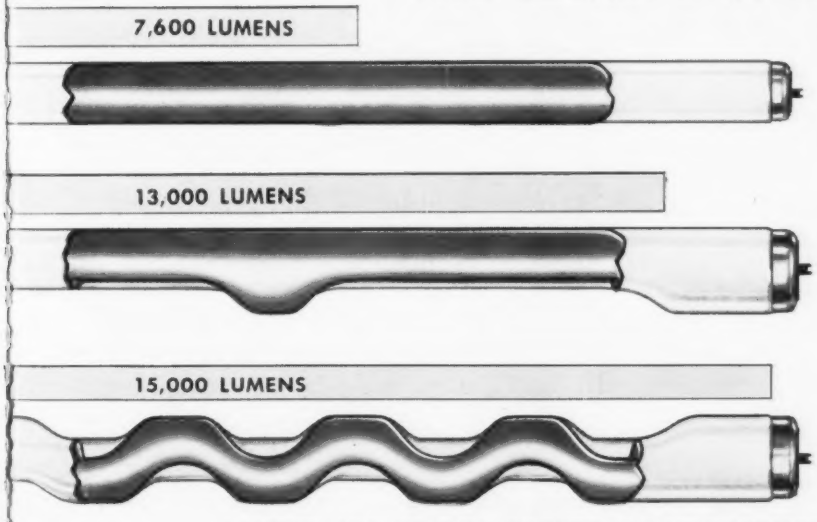
RATED LIGHT OUTPUT 15,000 LUMENS



Grooves or panels "squeeze" arc to increase light-producing power, give you same strength with thinner glass. They also aid light emission, enabling you to use more of total light given off by phosphor.

New configuration makes arc stream travel in a wavy path, makes greater electric power available for producing light. You get the arc equivalent of a 9-foot lamp!

THE SECRET'S IN THE SHAPE



REGULAR FLUORESCENT, shown here in the conventional round shape of the High Output Lamp, has a straight arc stream. As in the case of *any* fluorescent, this arc causes mercury vapor to radiate energy which excites phosphor on inside wall. This, in turn, gives off light.

ORIGINAL POWER GROOVE, developed by General Electric in 1956, has an interrupted groove along one side, continuous except for bridging at regular intervals to increase glass strength. Grooves or panels "squeeze" the arc to increase the light-producing power.

NEW POWER GROOVE has grooves on both sides to accomplish same "squeezing" effect. In addition, it makes arc travel in wavy path—a full foot longer in 8-foot tube! This gives you even *more* light-producing power. New shape also enables you to use more of the total light given off by the phosphor.

LONGER ARC STREAM, GREATER LIGHT-PRODUCING POWER GIVE YOU A NEW LOW IN COST-OF-FLUORESCENT-LIGHT FOR MOST INSTALLATIONS

Progress Is Our Most Important Product

GENERAL ELECTRIC

New Equipment

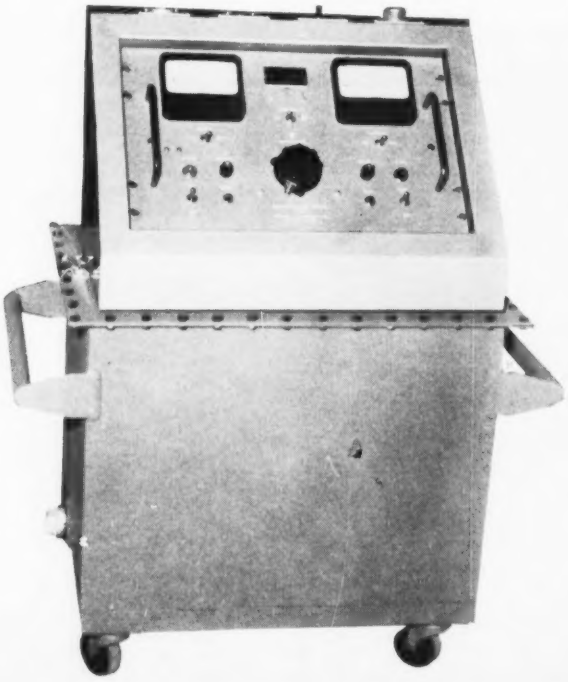
(For additional information, use Reader Service form, p 93)

Dry-Type Transformer . . .

. . . has low level of operating noise. Integral rubber insulators completely isolate core and coil from direct contact with transformer case. Transformers can be mounted directly to supporting structures or surfaces and directly connected with rigid conduit with freedom from excessive sound transmission. Additionally, a wound-and-cut core technique produces transformers more compact than normal units. Transformers are available in both single and 3-phase through 500 kva.
Hill Transformer Co, 1030 Washington St, San Carlos, Cal.

Switchgear . . .

. . . for complete range of 480-v service is now available. Featuring "closed door" disconnecting and drawout LA-75A low voltage power circuit breakers, the switchgear has a spring-held dust seal mounted on the inside of the door.
Allis-Chalmers Mfg Co, Milwaukee 1, Wis.



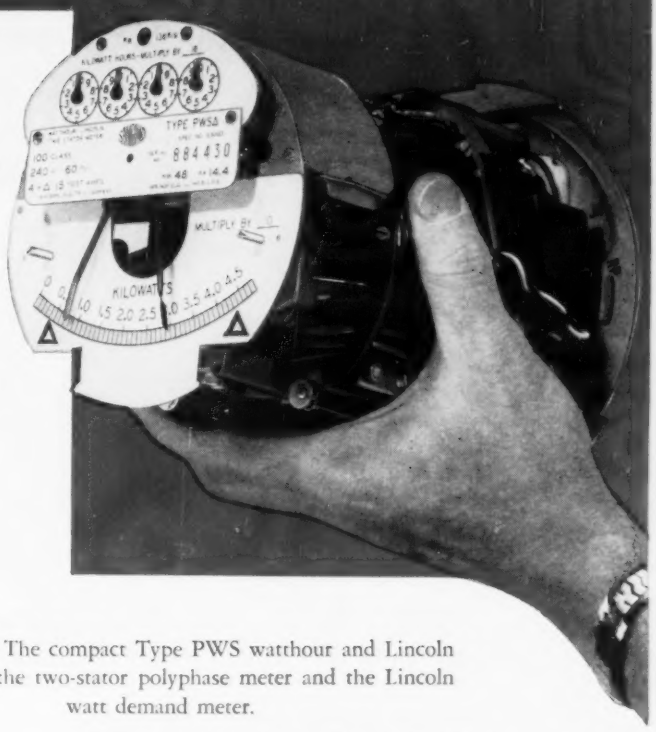
Overpotential Tester . . .

. . . has an output of 120,000 v. The two-piece unit may be stacked for mobile use and rolled to the job. The control section may be readily removed from the high voltage tank section for remote control. The tester features the use of selenium rectifiers and low input power requirements. It may be used for measurement of leakage current.
Peschel Electronics, Inc, Patterson, N. Y.

(More New Equipment on page 89)

DEVELOPED TO MEET YOUR NEEDS:

NEW SANGAMO DEMAND METERS of the type that YOU prefer!



THERMAL DEMAND The compact Type PWS watthour and Lincoln demand meter combines the new features of the two-stator polyphase meter and the Lincoln watt demand meter.

It's easy to read—easy to adjust. Simplified design makes components readily accessible.

Where future load growth is anticipated, capacity of the demand element can be doubled by changing two link connections and changing the demand scales (24/48 kw or 48/96 kw).

MECHANICAL DEMAND

Sangamo's new Type D mechanical demand register, when installed on any of the Sangamo Type P2 extended range watthour meters, accurately measures kw demand on all polyphase loads.

Universal and standard Type D registers were designed to give greater disk visibility, better service accuracy, time interval indication, and simple disengagement of timing motor for register checking.

ACKNOWLEDGED LEADERSHIP IN DEMAND MEASUREMENT

SANGAMO ELECTRIC COMPANY

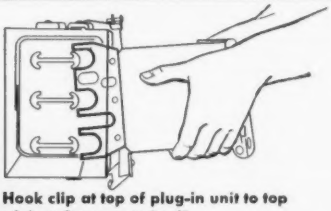
SPRINGFIELD, ILLINOIS

JM59-2

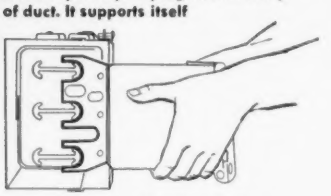
Another Reason for Using Square D Aluminum Plug-in Duct...

SQUARE D PLUG-IN UNITS GIVE YOU EXCLUSIVE *hook-swing* MOUNTING

Safer, Faster, Easier Mounting



Hook clip at top of plug-in unit to top of duct. It supports itself



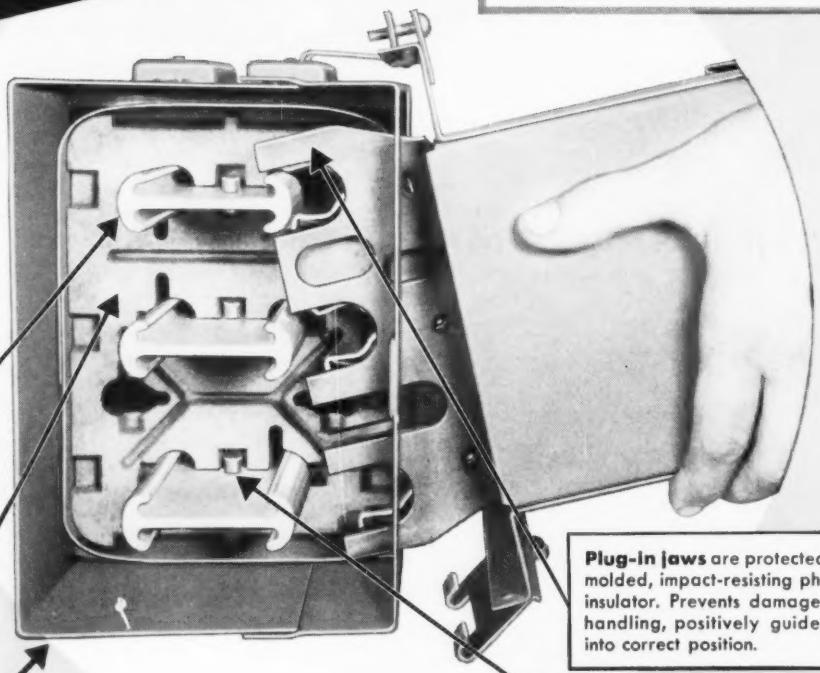
Then, just swing plug-in unit down until jaws engage bus bars

Hanger mounting (*not shown*) makes installation easy. A universal hanger permits mounting in *any* position. Just suspend and level top portion of hanger, then clip on lower portion. U.L. approved for 10-foot spacing.

I-beam construction of bus bars—a Square D exclusive—provides four times the strength of conventional bus bars. Bars are zinc, copper and silver-plated full length.

Full width bus support provides greater strength on short circuits, freedom from vibration. Also acts as fire stop where duct passes through walls and floors.

Square D duct is totally enclosed for maximum safety—no danger of accidental shorts. Prevents overheating from dust accumulation.



Plug-in jaws are protected by a molded, impact-resisting phenolic insulator. Prevents damage from handling, positively guides unit into correct position.

Steel pins in each bus bar prevent bars from shifting and support them on vertical riser installations.

With other plug-in duct, it's no easy job to mount the plug-in units. In fact, it takes a lot of real pushing which is neither safe nor easy when you're working on a ladder. With Square D's exclusive *hook-swing* mounting, you just hook the plug-in unit to the top of the duct. Then, simply swing it down and in until the jaws have engaged the bus bars. No awkward pushing required—no unnecessary chances to take.

Square D aluminum plug-in duct with exclusive *hook-swing* mounting costs no more—why settle for less?

Write for Bulletin SD-110. It gives the facts on Square D aluminum plug-in duct. Address Square D Company, 6060 Rivard Street, Dept. SA, Detroit 11, Michigan

EC&M HEAVY INDUSTRY ELECTRICAL EQUIPMENT...NOW A PART OF THE SQUARE D LINE

SQUARE D COMPANY

Switchboards . . .

. . . **only 14 in. deep** are now available. The switchboards, designed for medium size commercial and industrial buildings, can utilize a variety of interchangeable distribution and control units. They are voltage rated up to 600 v ac and 250 v dc. Their bus ratings are: vertical, 200 to 1,200 amp; and horizontal, up to 2,000 amp.

Federal Pacific Electric Co, 50 Paris St, Newark 1, N. J.

Indoor Transformer . . .

. . . **line has been extended** to cover 112.5 and 150-kva ratings. These additions to the Modupac line complement the present 225 and 300-kva sizes. The standard modules allow fast shipment and increase flexibility, because the modular components are interchangeable between units. In all four units, the transformer tank is braced for full vacuum, yet each unit is small enough to pass through industrial doorways.

Westinghouse Electric Corp, Box 2099, Pittsburgh 30, Pa.

Recloser . . .

. . . **is available in an improved model** having increased interrupting ratings. Designated the Type E, it is intended for use on distribution circuits having phase-to-phase voltages of 2.4 to 23 kv, fault currents up to 2,500 symmetrical amp, and load currents ranging from 5 to 100 amp. Three reclosers can be electrically interlocked to provide

(*Continued on page* 92)

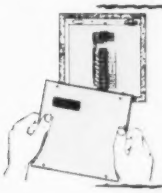
* . . . THE UNITIZED COMMUNICATION SYSTEM . . .

GTC

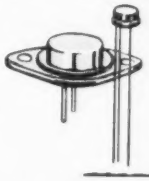
*an effective, economical industrial communication system designed to provide swift and sure voice communications regardless of distance or surrounding noise conditions.

COMPLETELY TRANSISTORIZED AND DESIGNED TO MEET THE CRITICAL REQUIREMENTS OF INDUSTRY

1. An effective, economical industrial communication system designed to provide swift and sure voice communication under adverse environmental conditions such as extremes of temperature and noise.



2. All amplifiers are "plug-in" contributing greatly to ease of installation and MAINTAINABILITY.



3. Transistors and rugged, industrial type components are used throughout. No vacuum tubes or "entertainment" type components of any kind are employed.

4. Central Control cabinet is eliminated thus reducing space requirement to a minimum.

5. ULTRA SIMPLE WIRING PLAN (no shielded cables) and UNITIZED EQUIPMENT with integral terminal facilities make for EASY LOW COST INSTALLATION and LATER EXPANSION.

* GAI-TRONICS TRANSISTORIZED COMMUNICATIONS

GAI-TRONICS
CORPORATION
Dept. A
READING, PENNA.
A SUBSIDIARY OF GILBERT ASSOCIATES, INC.
ENGINEERS AND CONSULTANTS

GTC is extremely flexible in application. Write today for a copy of our completely illustrated, descriptive booklet and name of nearest representative.

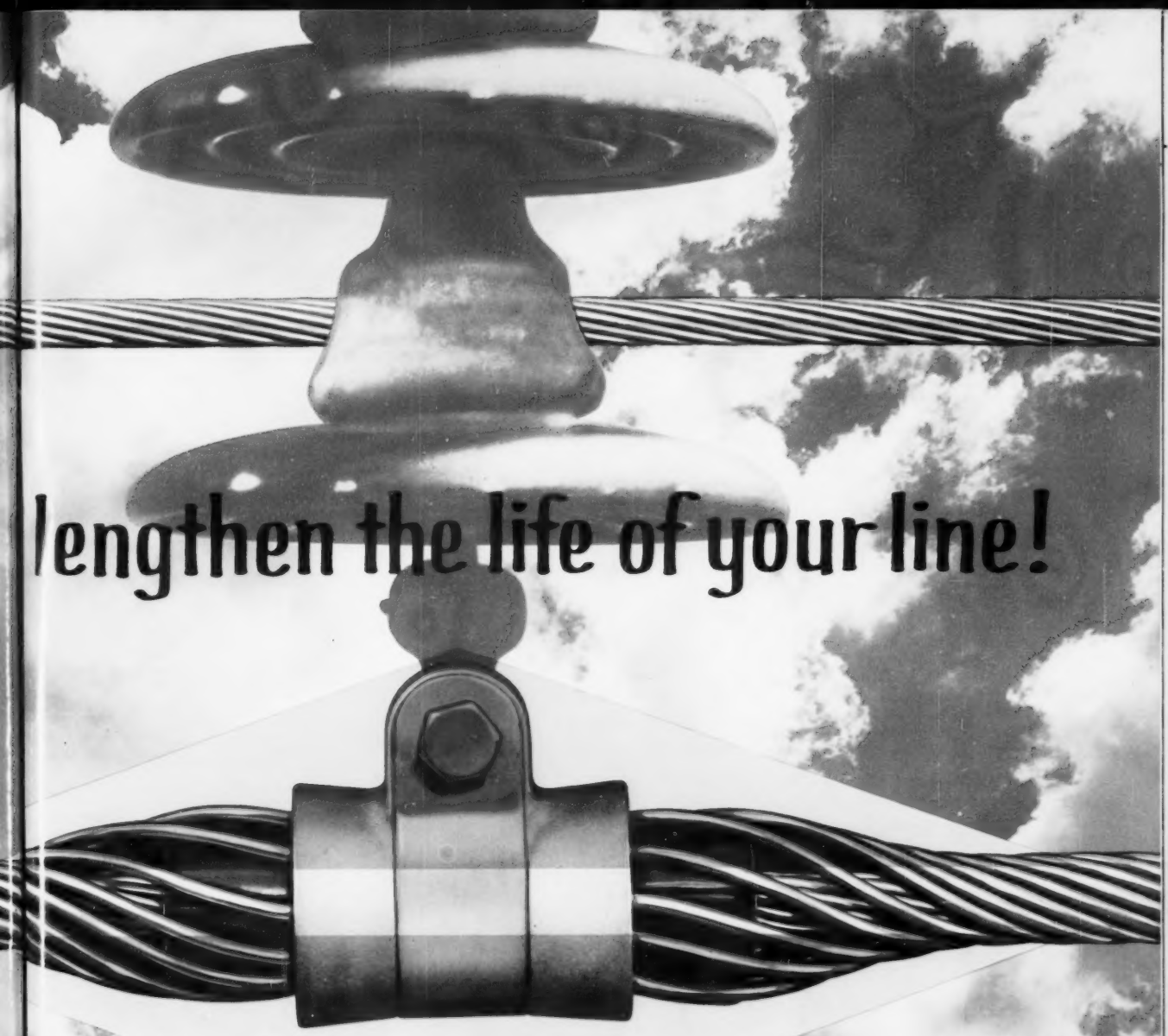
CONCENTRATED STRESSES CAUSED

BY VISE-LIKE CLAMPS MEAN LINE FAILURE!

Comprehensive new folio tells how and why AGS* eliminates line failures.

Send for your copy:

PREFORMED LINE PRODUCTS COMPANY
DEPT. AG
5349 St. Clair Ave. • Cleveland 3, Ohio



lengthen the life of your line!

eliminate failures by dispersing stresses over a wide area with...

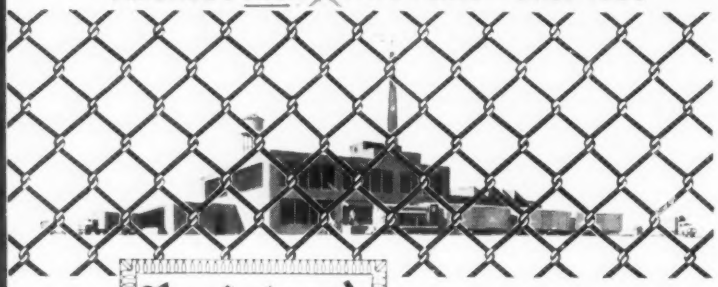
AGS* Preformed Armor-Grip* Suspension

You can look up to **Preformed***

Trade mark* Patented — U. S. Patent No. 2,722,393

PAGE chain link FENCE

America's First Wire Fence—since 1883



NOW **Registered** for double assurance of quality

—Another Progressive Step by PAGE!

• Top quality of materials has always been a distinguishing feature of PAGE Chain Link FENCE. This well-known value plus PAGE standards of workmanship in fence erecting by members of the Page Fence Association have given continuing assurance of reliable protection and good appearance. Now another forward step adds to value certainty. Each newly erected fence will be identified by a PAGE "REGISTERED" metal plate and a dated, numbered and signed Registration Certificate will be given to the owner. Registration of your new Page Fence and certification of its quality are assurance of long, dependable service and lasting satisfaction.

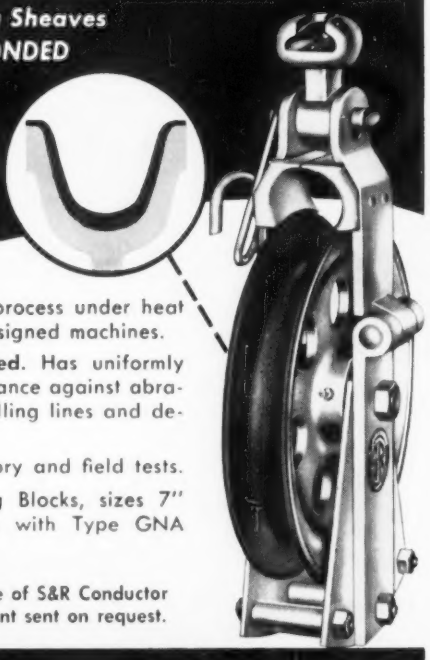
PAGE will help you to choose the RIGHT fence for YOU from a wide variety of fence styles and four superior fabric materials—including the new ACCO Aluminized Fabric. For information and name of nearest Association member, write for Folder DH-26.

Address: **PAGE FENCE ASSOCIATION**
National Headquarters • Monessen, Pa.

A PRODUCT OF PAGE STEEL & WIRE DIVISION, AMERICAN CHAIN & CABLE COMPANY, INC.

Now, Conductor Stringing Sheaves WITH PERMANENTLY BONDED

TYPE GNA NEOPRENE LINING



Molded by a vulcanization process under heat and pressure on specially designed machines.

Lining is **permanently bonded.** Has uniformly excellent properties for resistance against abrasive wear from wire rope pulling lines and deterioration from lubricants.

Proven by extensive laboratory and field tests.

All S&R Conductor Stringing Blocks, sizes 7" through 28", are available with Type GNA Neoprene Lined Sheaves.

NEW CATALOG on complete line of S&R Conductor Stringing Equipment sent on request.

SHERMAN & REILLY INC. CHATTANOOGA, TENN.

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Recloser . . .

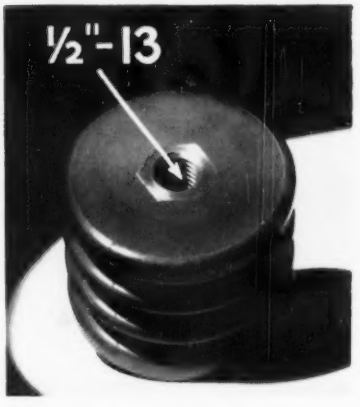
(Continued from page 89)

3-phase lockout when any recloser locks open. Clearing times of well under 2 cycles can be obtained. **Line Material Industries, McGraw-Edison Co, Milwaukee 1, Wis.**

Ultrasonic Cleaning . . .

. . . system is available in matched counter-height cabinets. The series C cabinets, welded of stainless steel to uniform dimensions (26 x 24 x 32 in. high) house the Sonogen generator, cleaning tank, filter, rinse tank and dryer. R-F output of the ultrasonic generator at 40 kc is 500 w average, 2,000 w peak on pulses. Power input is 1.5 kw, 115/230 v ac.

Branson Ultrasonic Corp, 40 Brown House Rd, Stamford, Conn.



Standoff Insulator . . .

. . . is available for apparatus and bus bar systems using ½-in. bolt mountings. Molded from Glastic UMG 1500 compound, it has great dimensional accuracy and high impact strength. The insulator is applicable on apparatus at voltages up to 5 kv.

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and

the sale of all the outstanding common stock of

Economy Fuse & Manufacturing Co.
Chicago, Illinois

to

Federal Pacific Electric Company

were negotiated by the undersigned

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MARCH 9, 1959

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How do *you* gain from this experience?

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Before you start your next job, see the Man from Anaconda. Backed by the broadest line of wire and cable in the industry, in both copper and aluminum, he is highly qualified to help you arrive at the best answer to your cable needs.

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Stringing 230,000-volt line on steel towers between Brownlee development and Boise, for the Idaho Power Company. The transmission line uses 408 double-circuit towers spanning 100 miles of rugged terrain. Cable was strung from trucks like these, to fill increasing power needs of the Pacific Northwest. This project will contribute, in addition to power, flood control, recreational fish conservation and navigation benefits.

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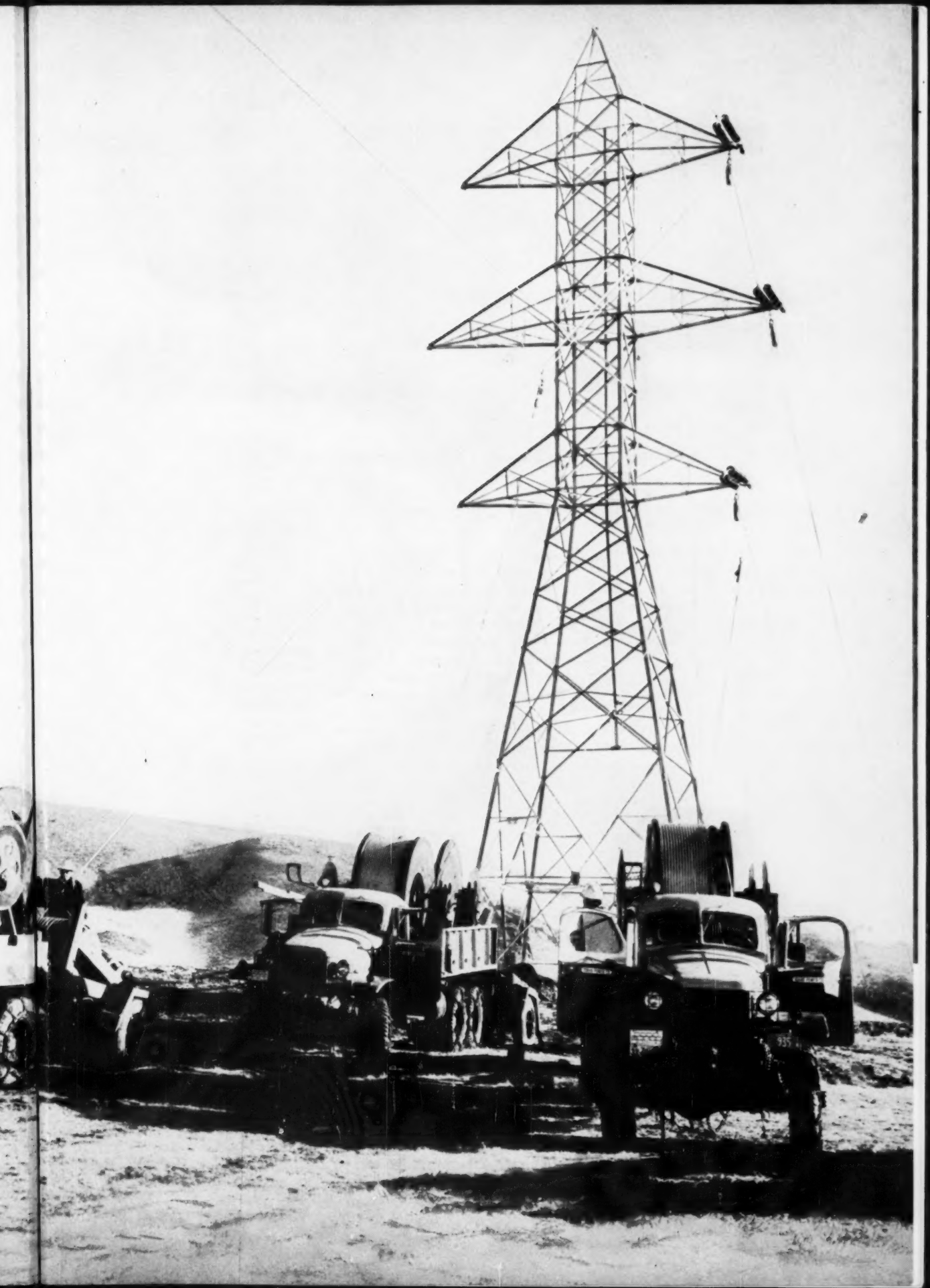
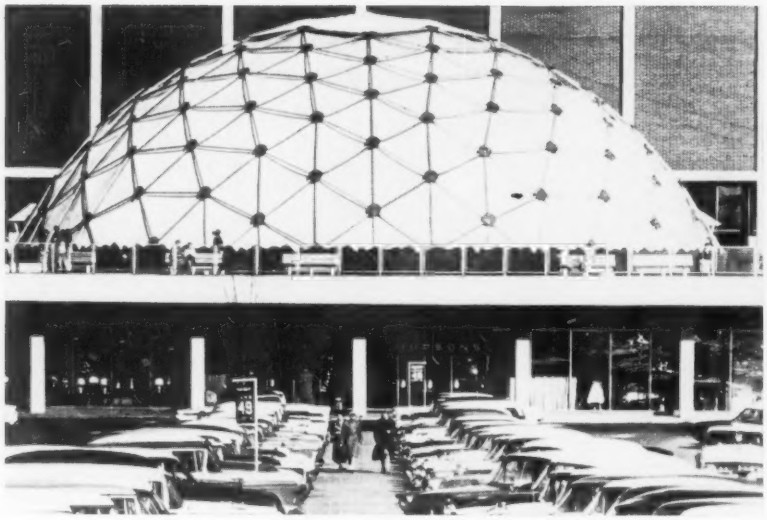




Electric Heat Helps Attract Shoppers

Electric heat solved the problem of heating a large, geodesic dome at a shopping center in Detroit, Michigan, when the owners wanted to make it available for year 'round special public events.

Heating the structure to any 50-70F comfort level for winter events, considering the large area and the thin, uninsulated film roof, was the problem. There was no reasonable way, costwise or otherwise, to use other forms of heating. Electric heat was the only answer.

Because of a scheduled event, the electric heaters had to be on the job and ready to operate in one week. Five ceiling-type unit 15-kw heaters were installed above the entrance leading from the main building. Sheet-metal feeders were attached to the heater outlets to direct heat on people as they entered. Distribution feeders were run from built-in outlets to the heaters. Edwin L. Wiegand Co, Pittsburgh, Pa., supplied the heating equipment.

Total load is 75 kw, plus 10 to 15 kw of lighting. The electric heaters and other heat sources raise the temperature on an average of about 25 deg above outside temperatures, considered adequate as most visitors wear outside apparel.

Since installation, the dome has been used for teen-age dances, new car previews, trade shows, and as a legitimate theatre.

Duquesne Light Requests Special Heating Rate

Duquesne Light Co has begun a program to encourage the all-electric home, to include electricity for heating, cooling, clothes drying, cooking, water heating, and all other uses performed with electricity.

The company has also submitted a request to the Pennsylvania Public Utility Commission for a new residential electric heat rate, of 1.5¢ per kwhr, in excess of 6,000 kwhr per year. The new rate also provides for equal budget payments during each month.

Carolina P&L Offers Service to Housewives

Carolina Power & Light Co has come up with a new service for Carolina housewives who have too much month left over at the end of the money.

The program, entitled "Money Management" offers guides and suggestions for making the family income go farther. It will extend over a 3-yr period and be updated to meet changing economic conditions.

Presentations, which will be shown to any adult group free of charge, include visual aids and statistics to show results of economic surveys, market studies, family budget tests and other elements of family planning. Printed materials will be distributed.

Westinghouse Develops Air Conditioning Computer

An electronic computer, which can tell in 24 seconds how much air conditioning capacity is required in a particular house at a particular location, has been developed by Westinghouse Electric Corp.

The Westinghouse Analog Recording Air Conditioning Computer is designed to consider over 50 factors which influence the indoor temperature of a house. The information is then programmed into the machine through a set of dials and switches.

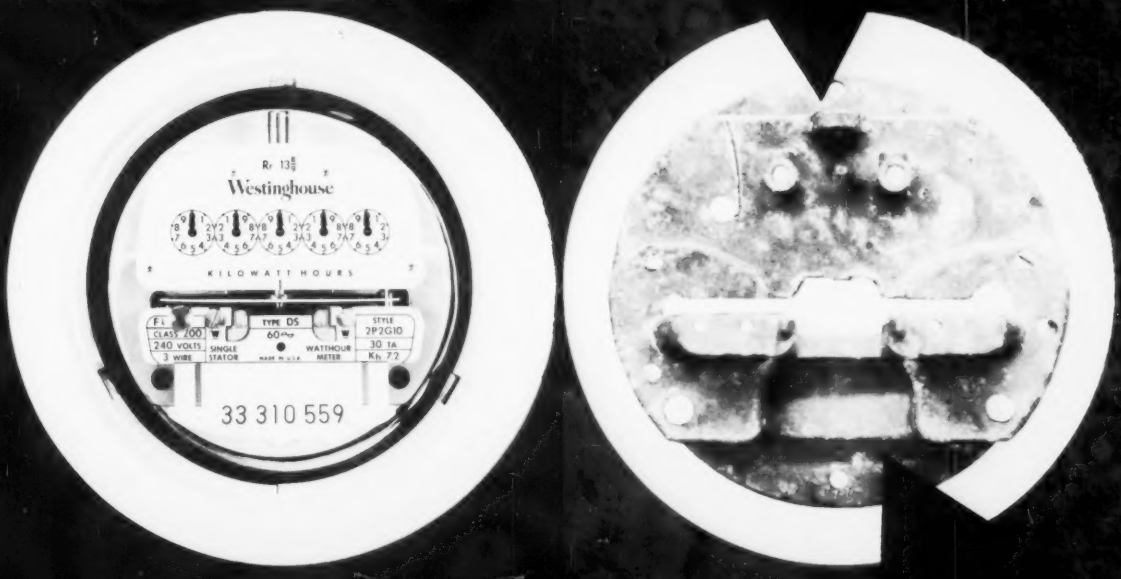
Westinghouse does not plan to use it in calculating individual home owner requirements at this time.

Housepower Program Plans Big Spring Push

The Housepower Program, now part of EEI's National Electric Living Program, is preparing a big spring push.

A series of three ads will run in Look Magazine. All will be designed to resemble the magazine's Photo-Quiz feature. Full-column ads will run in the Saturday Evening Post and Better Homes & Gardens in cartoon style with limerick sales copy.

A composite of the Look ads is available as a consumer hand-out or mailing piece. Write: EEI, 750 Third Ave., New York 17, N. Y. Price: $3.40 per hundred.



Westinghouse meters stop corrosion's bite

They also minimize the bite that meter maintenance and replacement costs take out of revenue. This new line of Westinghouse meters is the product of the most rigorous and exhaustive tests that the best meter research laboratory in the industry could devise. Complete compatibility of materials and finishes is the design secret which permits us to offer up to 500 per cent better corrosion resistance — even under the most extreme operating environment.

Westinghouse developments in the past two years have set the pace for the industry — and we're not stopping here. Watch Westinghouse meters for the Bonus Value Beyond Specifications.

YOU CAN BE SURE... IF IT'S **Westinghouse**

WATCH "WESTINGHOUSE LUCILLE BALL-DESI ARNAZ SHOWS" CBS TV MONDAYS

CHECK THESE BONUS VALUES FOR A BETTER METER BUY

Corrosion-Resistant Finish

(Epodur* protected frame—fully compatible finishes on all components)

Single-Metal System

(elimination of dissimilar metals in the register eliminates possibility of galvanic corrosion)

True Lightning Protection

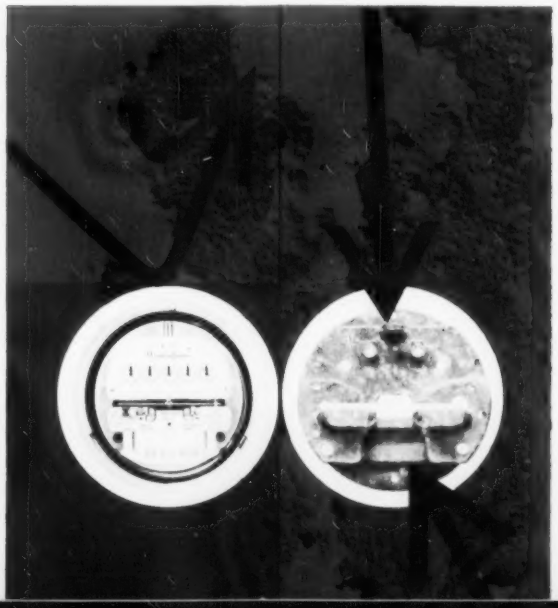
(exclusive Westinghouse De-ion* arrester gaps discharge surges harmlessly—outside the meter)

Lifetime Guarantee

(accurate registration, corrosion resistance, high insulation levels and thermal capacity—all offer a lifetime of bonus performance)

Watch the mail for this brochure, or get one from your Westinghouse sales engineer. It shows why Bonus Value is an important part of every Westinghouse meter.

*Trade-Mark



YOU CAN BE SURE...IF IT'S

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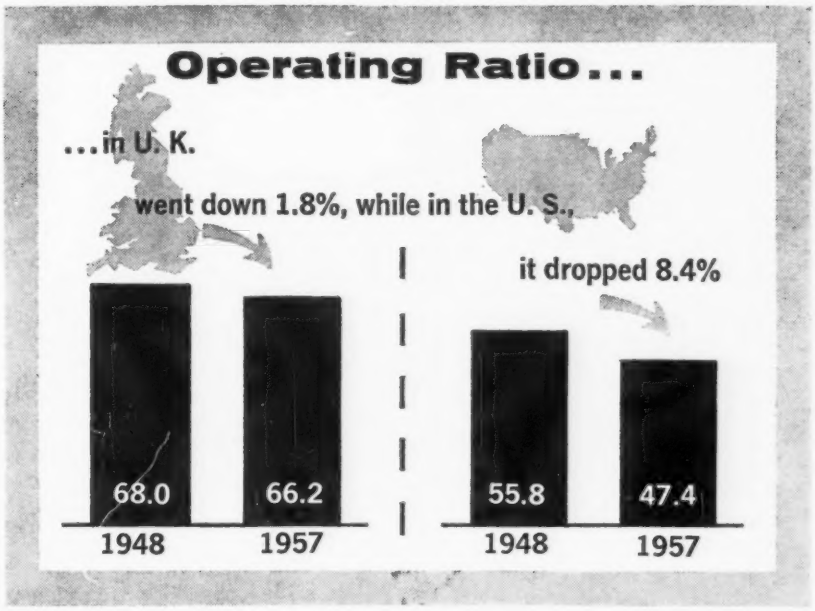


Report on
British Nationalization

Government Power in Action

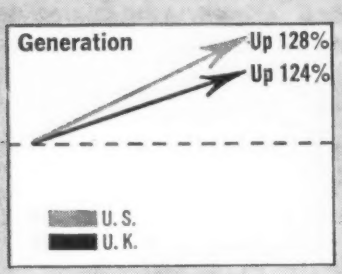
Critics of the investor-owned utility industry sometimes make the statement that government-owned utilities, particularly foreign ones, have not only done more for their customers, but also operated more efficiently than the private utilities of the U. S. The facts don't bear this out. A comparison of operating data shows that in the past decade U. S. investor owned systems have improved more, in both efficiency and customer service, than the government-operated Central Electricity Authority of Great Britain.

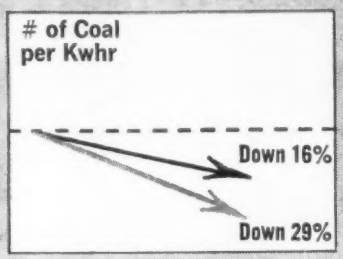
The British CEA is taken for example because it is a utility with a history of good accounting and honest statistical records. Its selection implies no intent to disparage the British. On the contrary, CEA's good record over the past ten years makes the superior record of U. S. Class A & B companies more meaningful. To take a single comparison: From 1948 to 1957 the CEA's operating ratio improved from 68% to 66.2%, a decline of 1.8 percentage points. In the same nine-year period, the U. S. Class A & B private utilities went from 55.8% to 47.4%—a major decline of 8.4 percentage points.

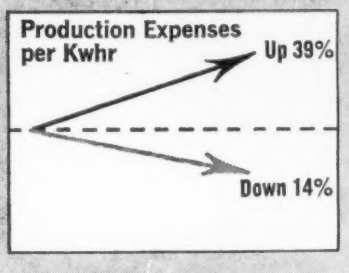
But no single statistic tells the story. There are too many differences between the economies of the U. S. and the U. K. (Inflation has been about twice as severe in Britain, and the cost of fuel there increased 71% from 1948 to 1957, while ours rose 18%.) But the following comparisons still sketch an interesting picture of trends in the two countries. CEA data is for the year ended March 31, 1948 and the year ended March 31, 1958; for U. S. Class A & B private utilities, it is for calendar years 1947 and 1957, unless otherwise indicated.

Total generation of the British CEA increased by 124% in the decade—from 38.7 billion kwhr to 86.6 billion kwhr. U. S. Class A & B's did just about the same—a 128% increase from 209.6 billion kwhr to 478.4 billion kwhr. But the U. S. made more progress in trimming its coal rate: While CEA cut the number of pounds of coal per kwhr from 1.487 to 1.254 (down 16%), the U. S. figure

Here's a Ten-Year Comparison between







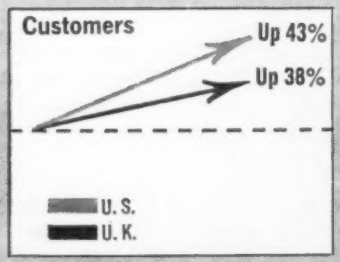
dropped from 1.307 to 0.929—a 29% decrease. There was no material change in average Btu's per pound of fuel in either country. In thermal efficiency (Btu's per unit sent out) CEA showed a decline of 16.8%, while the comparable U. S. figure was down 27.7%. Finally, production expenses per kwhr rose 39% in Great Britain, while those of U. S. Class A & B's declined by 14%.

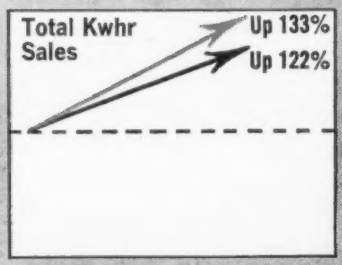
Transmission and distribution expenses per customer rose 97.5% in Britain (1948-57) while U. S. Class A & B private utilities increased 33.6%. The U. K.'s more rapid rate of overall inflation accounts for some of this differential, but by no means all of it. Indeed, with a more compact service area, CEA is in a better position for T&D economy than the U. S. utilities.

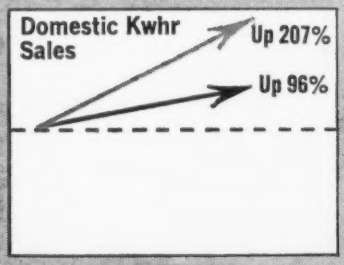
An interesting point is that CEA's total employees increased twice as fast—by 26% as opposed to 13.5% in the U. S. And the number of employees per 1,000 customers decreased three times as fast in the U. S.—16% compared with 5% in Britain. More important, the U. S. made more progress in reducing the number of employees needed per Mw of capacity. For CEA, the number declined from 13.8 to 8.3 employees per Mw. U. S. Class A & B's went from 6.65 to 3.24 employees per Mw. Not only did the U. S. companies start with a smaller figure, but they increased their relative advantage during the period.

The fact that the U. S. has a higher proportion of hydro capacity does not invalidate this comparison, since more than 95% of the capacity added by Class A & B companies during the period was in steam-electric power.

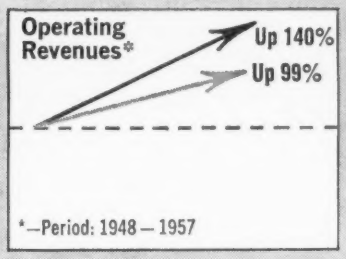
Production expenses as a percent of revenue went up in U. K., down in U. S. The CEA shows an increase from 46.5% to 48.8% (up 2.3 percentage points); Class A & B private utilities in the U. S. show a drop from 34.3% to 27.0%

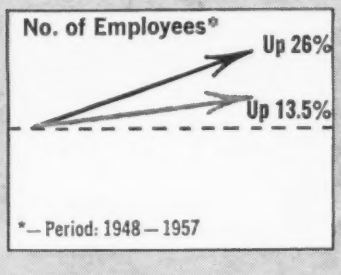


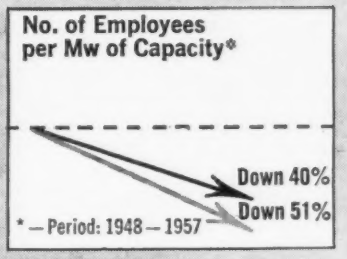




British and U. S. Electric Systems





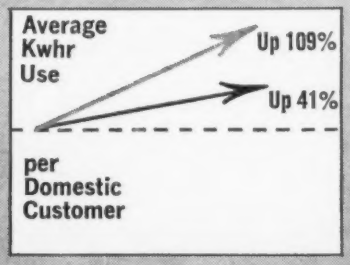


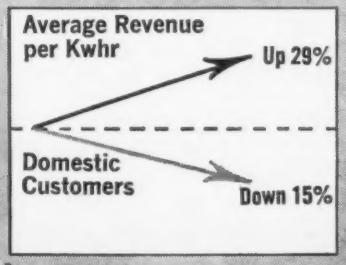
(down 7.3 points). These figures are especially impressive since operating revenues gained 140% for CEA compared with 99% for the Class A & B companies.

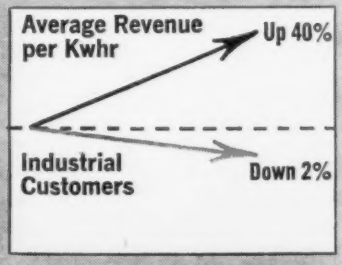
CEA's better revenue performance stemmed from substantial rate increases put into effect in all customer classes, since CEA added customers at a slower rate (38% vs 43% in the U. S.), and its total kwhr sales also increased less (up 122% vs 133% in the U. S.) than the Class A & B companies. These rate increases show a realistic appreciation of the fact that even a government utility is not immune to the action of economic forces. In other words, the customer has not been isolated from the effects of inflation as he has been here.

For one example, consider the residential customer. From 1948 to 1957 CEA's average revenue per kwhr sold to residential customers increased 29%. It decreased 15% in the U. S. Significantly, British annual residential use increased from 1,200 kwhr to 1,690 kwhr—up 41%—while the comparable gain for U. S. Class A & B companies was from 1,407 kwhr to 2,935 kwhr—up 109%. But the British residential customer's average bill actually increased faster—82% as opposed to 78% in the U. S. It is hard to see how the British residential customer, with his usage of electricity increasing slower and his bill rising faster, has fared as well under government ownership as his American cousin, the customer of the Class A & B private utilities.

Has the advantage gone to the industrial customer then? No, it has not. British industrial sales, abnormally low in 1947, have increased more than U. S. industrial sales—130% compared to 114% for Class A & B companies. However, while revenue per kwhr from industrial customers declined 2% in the U. S., the CEA increased its take by no less than 40%. Nor have commercial customers fared as well in the U. K. During the period, commercial sales increased 156%

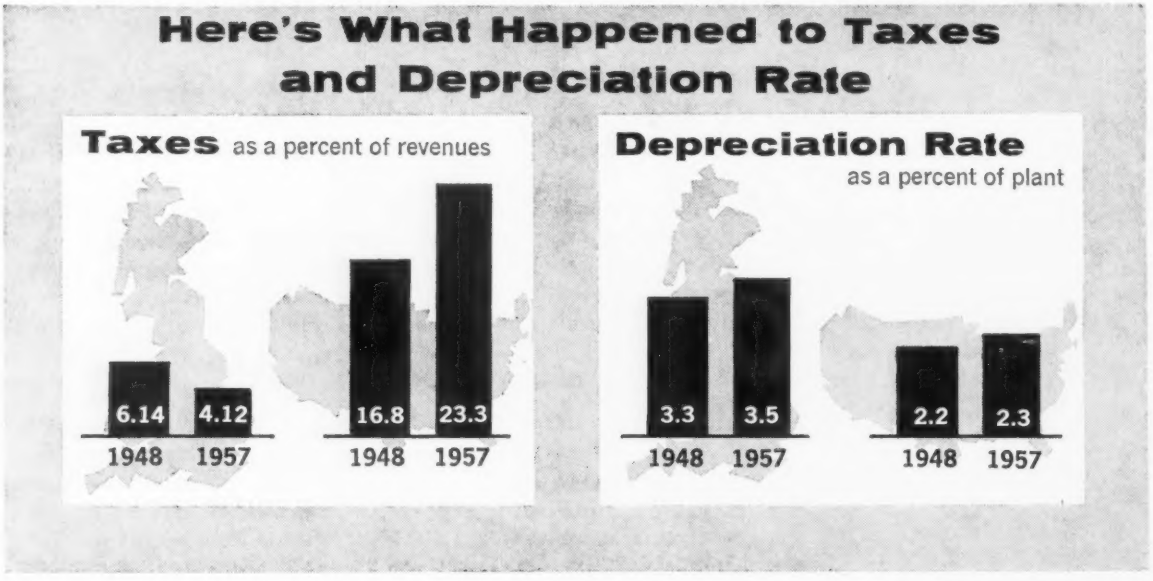






for the CEA, and 163% for the Class A & B's. Commercial revenues per kwhr increased 19% for CEA, and decreased 11% for U. S. Class A & B's.

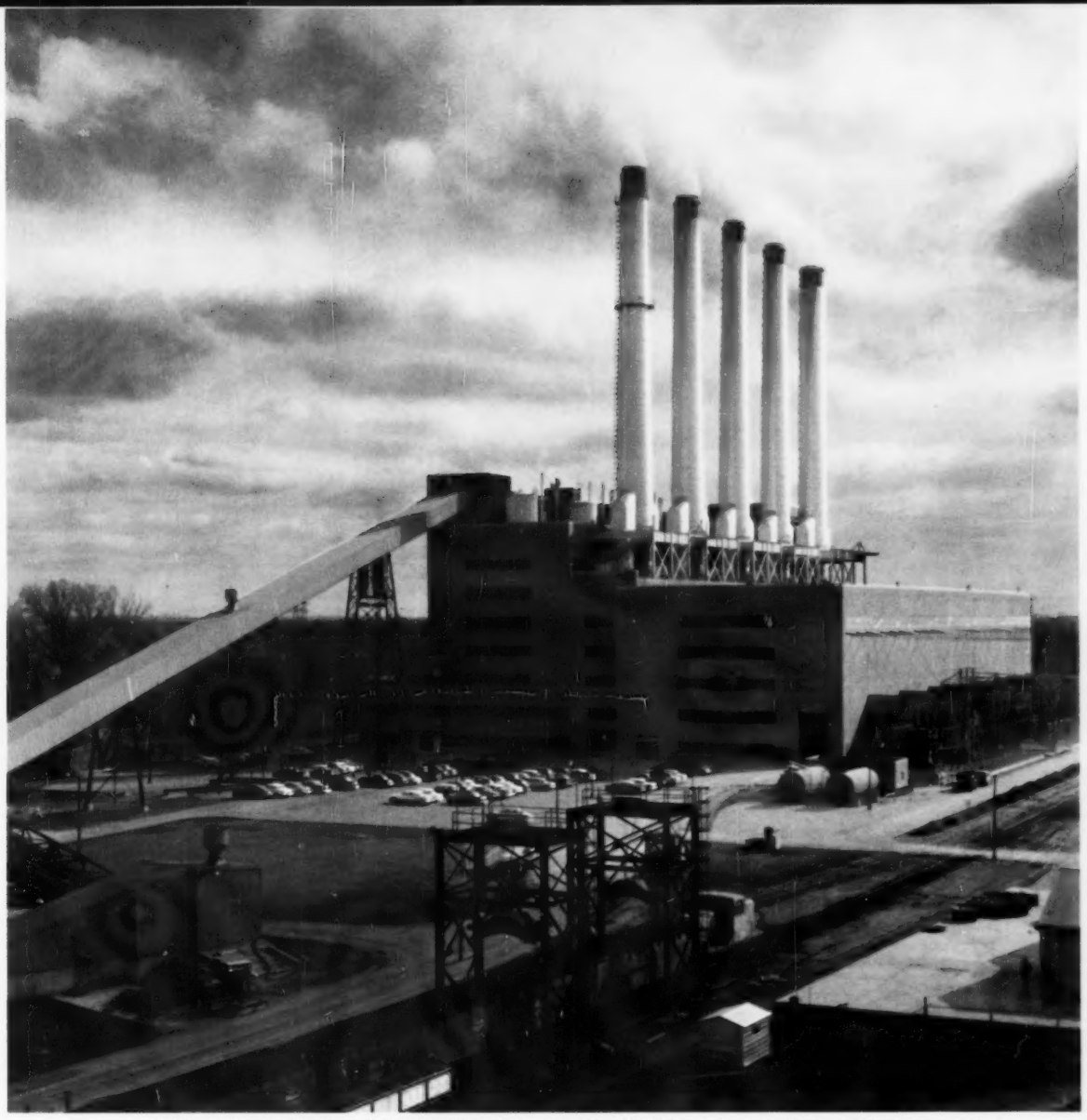
Two other comparisons emphasize the more salutary climate which the government-operated British system enjoyed during the period of comparison. In 1948, the CEA paid 6.14% of its operating revenues as taxes. By 1957 the percentage had declined to 4.12%. U. S. Class A & B companies, on the other hand, started out in 1948 with taxes taking 16.8% of the revenue dollar, and in 1957 they paid taxes amounting to 23.3% of revenues.



CEA also has had the advantage of a realistic depreciation policy. In 1957 CEA's depreciation amounted to 3.51% of gross plant, vs 2.3% for the Class A & B companies. More important, the CEA's depreciation reserve as a percent of plant came to 38.3% in 1957, while the Class A & B's depreciation reserve amounted to 18.9%—less than half the British figure. Taking into account the inflation which has taken place in Great Britain, CEA's depreciation reserve is still 19.2% of current value. Since it has been calculated that a trended original cost reserve requirement would amount to about 22%, this depreciation policy has allowed CEA to come very close to the point where plant can be replaced at present costs from the depreciation reserve.

Several conclusions stand out from this comparison. CEA must be commended for its realistic depreciation policy, and for its realistic pricing, however unpalatable that may be to the consumers. It may well be that U. S. investor-owned utilities, because of regulatory pressure, have been put in the position of giving too much for too little, and making the owners of the property underwrite many of the benefits received by the customers.

But it is hard to escape the conclusion that the Class A & B utilities, under private management, have given more service at less cost to the greater number of people. No single statistic proves which system—government control or private enterprise—works better. But the aggregate of all seems to show the emergence in Britain of what might be called a typical bureaucratic pattern: More employees added, a slower rate of technological improvement, and ultimately, higher costs to the customer.



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Wabash River Station, a mine-mouth plant, is an example of the rapid growth of the facilities of Public Service Company of Indiana, Inc. Since 1939 the company has authorized 1,500,000 kw of new capacity. 300,000 kw is now under construction and will enable the company to keep pace with Indiana's increasing industrialization and population growth. Design for these generating facilities, as well as for major substations and transmission lines, has been performed by Sargent & Lundy.

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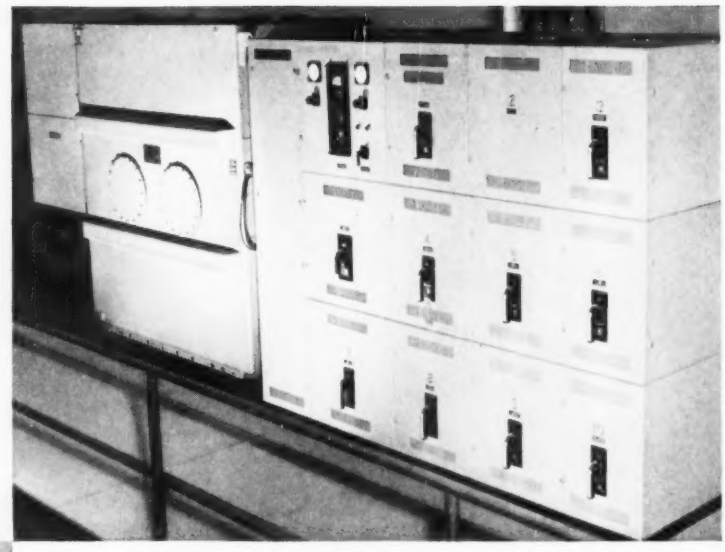

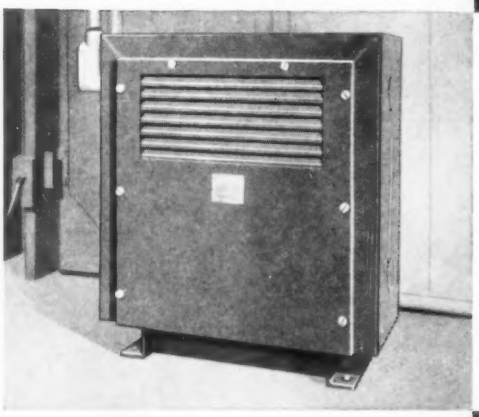

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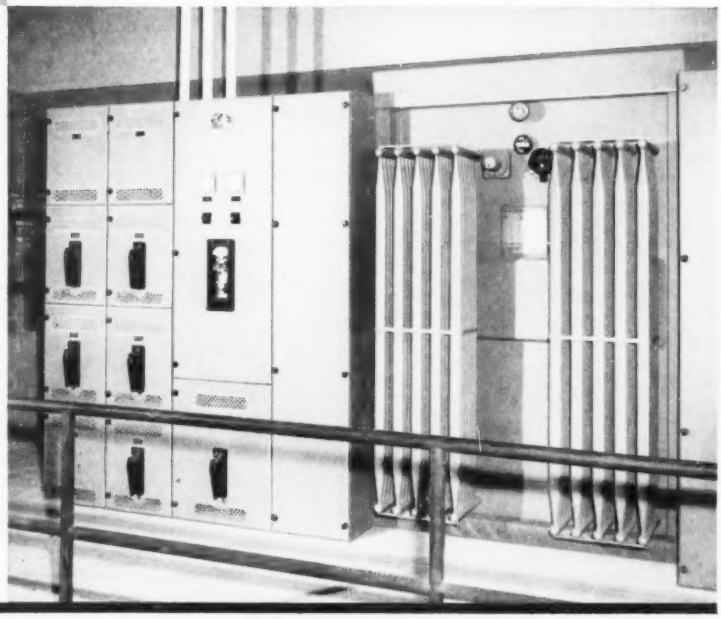
Bulletins TU-205 and TU-214 give full information on Wagner Load-Center Transformers. Write today.

WT59-2



BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

Wagner Electric Corporation

6456 Plymouth Ave., St. Louis 14, Missouri.

SERVING 2 GREAT GROWTH INDUSTRIES . . . *ELECTRICAL . . . AUTOMOTIVE*

Yetter Heads PS of Colorado Public Relations

Paul A. Yetter has been made vice president in charge of public relations activities for Public Service Co of Colorado. He had formerly been vice president of division operations. In his new responsibilites he will be in charge of the company's advertising, employee and public information departments and other related assignments.

Ralph Sargent Jr. becomes manager of division operations.

Yetter started with the company in 1923 and served in various electrical engineering capacities until 1940 when he was appointed district superintendent at Fort Collins. He then held executive positions at Grand Junction and returned to Denver in 1953 as manager of division operations. He was elected vice president of division operations in 1956.

Sargent has most recently been assistant to the president for Public Service. Before that he was a partner in the law firm of Lee, Bryans, Kelly and Stansfield, general legal counsel for the utility. He also served as assistant attorney general of Colorado.

Schoenbucher Made a Vice President

Gustave A. Schoenbucher has been named vice president of the New England Power Service Co. He succeeds Herbert W. Greenhalgh who has retired after 40 years with the New England Electric System.

In his new post, Schoenbucher will have general supervision over plant accounting and depreciation for all NEES companies.

He joined New England Electric System in 1937 as a plant accountant for the Service company. In 1938, he transferred to Green Mountain (Vt.) Power Co, and since 1948 had been assistant treasurer of New England Power Co.

Ohio Brass Elects Four VPs

LUSIGNAN

HOLAN

OTT

THOMPSON

The Ohio Brass Co has elected four new vice presidents: Joseph T. Lusignan, Louis J. Ott, Estes C. Thompson, and J. Howard Holan.

Lusignan has been named vice president-engineering and will continue to head all Ohio Brass engineering activities. He has been with Ohio Brass since 1930, first serving in the Power Utilities Dept in Mansfield, Ohio. He became executive engineer of the company in 1938.

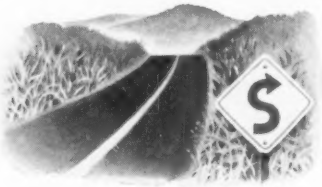
Ott will continue as general sales manager, as well as serving as vice president. He has been with Ohio Brass since 1927, and was named advertising manager in 1935.

Thompson has been elected vice president-manufacturing, but will also continue as general factory manager. Joining the company in 1937, he initially served as sales engineer in the Power Utilities Dept. He was appointed general factory manager in 1956.

Holan will continue to serve as president and treasurer of Holan Corp, an Ohio Brass subsidiary. He founded Holan Corp in 1947 as a manufacturer of truck-mounted power equipment and utility bodies.

Whatever your brush problem

Line?



Roadside?

Right-of-way?

WEEDONE can solve it!

With the right background—Chemical control of weeds and brush has developed along established lines of procedures and practices. Amchem initially pioneered the major advances in the field, has originated many of today's accepted procedures and products for efficient, economical weed and brush control. Your problems are in *experienced* hands when you hand them to Amchem!

With the right approach—Amchem's corps of weed and brush specialists are basically application specialists. Combining comprehensive theoretical and practical experience they are able to offer all industry a realistic approach to *any* weed or brush problem. These specialists have developed a variety of efficient weed and brush eradication programs over thousands of miles of line, roadside and right-of-way areas once choked and inoperable due to infestation.

With the right product—Amchem's tremendously diversified product line is your assurance that the right weed and brush killer is available and will be utilized for your specific problem. Weedone Brush Killers, for example, have been used in the field for years and proven eminently successful in eliminating weeds and brush wherever they are a problem. Why not bring your problems to Amchem?

Amchem and Weedone are registered trademarks of Amchem Products, Inc.

AMCHEM PRODUCTS, INC.
AMBLER, PA.

Please send me copies of your "Brush Control" brochure and full information on the uses of Weedone Brush Killers.

Name_____ Title_____

Company_____

Address_____

City_____ Zone____ State_____

AMCHEM

WEEDONE

BRUSH KILLERS

another chemical development of
Amchem Products, Inc.
(Formerly American Chemical Paint Co.)
St. Joseph, Mo. • AMBLER, PA. • Niles, Calif.

Middle West Elects Swanson Vice President

Leroy A. Swanson has been elected a vice president of Middle West Service Co. Joining the company in 1933, he is now in charge of office automation and systems and procedures studies.

A lawyer, certified public accountant and a graduate civil engineer, he became a C.P.A. in 1940 and was admitted to the Illinois Bar in 1945.

Day-Brite Names Three to New Positions

Day-Brite Lighting, Inc, has appointed George J. Taylor (see photo), vice president and director of research. His new duties are in addition to being vice president in charge of eastern operations.

Charles L. Amick has been appointed executive director of the company's newly organized Research Department. Gordon Wells has been named general manager of sales.

(*Continued on page* 108)

INTERLOCKED ARMORED CABLE

For Power Distribution in New Plants or in Modernizing Old Plants For more current capacity than cable in conduit or other armored cable, *specify and buy Rockbestos A.V.C.* . . . for easy installation on racks or hangers beneath the ceiling or next to walls, *specify and buy Rockbestos A.V.C.* . . .

. . . To eliminate costly conduits and ducts . . . to save important dollars on materials and installation time, to permit quick, easy repairs, *specify and buy Rockbestos A.V.C.* . . . All interlocked armored cables are not alike . . . and, for maximum dollar-savings and maximum performance be sure to *specify and buy Rockbestos A.V.C.* Interlocked Armored Cable — the superior AVA Cable.

Write now for the new Rockbestos manual which gives the application and design data to help you *specify and buy Rockbestos A.V.C.*

ROCKBESTOS PRODUCTS CORPORATION, NEW HAVEN 4, CONNECTICUT

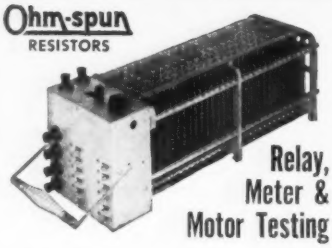
NEW YORK • CLEVELAND • DETROIT • CHICAGO • PITTSBURGH • ST. LOUIS • ATLANTA • DALLAS
SEATTLE • LOS ANGELES • BURLINGAME, CALIFORNIA

ROCKBESTOS A.V.C.

THE SUPERIOR A.V.A. CABLE

Leaders in Electrical Testing Equipment

Ohm-spun RESISTORS

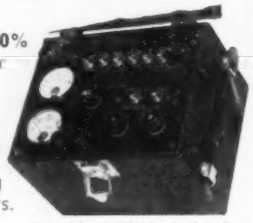


Relay, Meter & Motor Testing

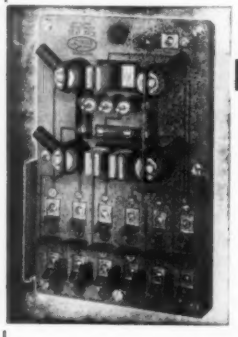
- Non-inductive Resistance
- Smooth adjustment from .05 amperes to full capacity of the load.
- Loads are made in different capacities; 30 amperes, 25/50 amperes and 60 amperes.
- Light in weight yet ruggedly constructed.
- All units self-ventilated.

Type ID Load

Provides **50% and 100%** Power Factor from **Single Phase Supply** when testing power meters.



Capacities available: 5-15 and 50 amperes



POLYPHASE METER TEST JACK

All connections made to terminals at bottom of the jack. No wires cross face of meter. Internal connections printed on front of jack. Other forms of Jacks now available.

THE STATES COMPANY
19 New Park Avenue, Hartford, Conn.
Please send me more information on:
☐ Resistors ☐ Type ID Loads ☐ Test Jacks
Name..... Title.....
Firm Name .....
City .....Zone....State.....

Day-Brite Appointments

(*Continued from page* 106)

Taylor is president of the Illuminating Engineering Society; Amick joined Day-Brite in 1955 as a regional manager and later served as acting vice president, sales department. Wells has been associated with Day-Brite for 18 years as a representative.

Basil Moves Up to VP Manufacturing

Rockbestos Products Corp has named Alexander S. Basil vice president in charge of manufacturing. He moves up from works manager, which he has been since 1957.

Basil was with the United States Rubber Company for more than 30 years. His most recent job with that firm was manager of sales development for the company's electrical products.

He joined the company in 1926, and served in sales, development and manufacturing capacities.

He also spent a year with Kaiser Aluminum & Chemical Co.

Brunner Appointed Director of Purchases

Philip F. Brunner has been appointed director of purchases of the Maryland Shipbuilding & Drydock Co. James A. McQuaid was made assistant director.

Brunner has been associated with the company for 20 years; McQuaid has been with it since 1948.

All Kidding Aside—
They Are Better Made!

PLASTIMAYD®

MANHOLE GUARD COVERS

- **FULL PROTECTION** *Without Light Loss!* Durable, pliable, 20 gauge KRENE is rainproof. Translucent—for maximum light in manhole. No-splash apron at bottom, snap closures.
- **SAFE!** Non-inflammable. 16,000 volts dielectric strength.
- Watertight Super-Weld* seams stand rough usage.
- **RESISTANT** to acids, oils, alkalis. Fold and store wet—won't rot, mildew.
- One-piece tent weighs only 9 pounds.
- Soap and water cleans it!

FITS standard Bell system type manhole frames. Spring-bar at top assures run-off.

VENTILATE as needed. Snap front flap as desired.

PLASTIMAYD
*TM CORPORATION
2204 S. E. Seventh Avenue, Portland 14, Oregon

You've got to put it into YOUR HEAD first before you can take anything from it. And reading is the quickest, surest way. In the Electrical Industry that's what Electrical World is for . . . to post you on events, new technology, problem-solving methods. Your name, residence address, and title on your letterhead will bring 52 weekly copies to your home. The cost: $6—no need to pay now.

Electrical World
330 West 42nd Street, New York 36, N.Y.

Efficient and Dependable

HELICOPTER SERVICE

Experts in Line Patrol
Right-of-Way Brush Control
Material & Equipment Transport

Cautious and experienced pilots available for every purpose—charter, lease, or on contract. Prompt service anywhere!

INLAND AIR LINES, Inc.
Myrtle Beach, S. C. Phone HI 8-7059

Waggoner Made West Coast VP

Raymond M. Waggoner has been named vice president in charge of West Coast operations for Hubbard & Co, a position he formerly held from 1952 to 1957. He is shown in the picture, seated with F. H. Kissner, chairman of the board (left); and Charles H. Dyson, president, (right).

During the past two years, Waggoner has played a major role in consolidating the Pittsburgh and Chicago pole line hardware plants, the building and staffing of the Electrical Research Laboratory, and the moving of Hubbard's executive offices to Chicago.

He joined Hubbard in 1922 in the Electrical Materials Division in Pittsburgh. He was appointed assistant sales manager of the Northeastern Division in 1928, and sales manager of the Midwest Division in 1936. He became vice president in charge of sales in 1948, vice president of Pacific Coast sales in 1952, and executive vice president in 1957.

PERSONAL BRIEFS

Robert H. Gerdes, executive vice president, Pacific Gas & Electric Co, has been named a member of the 32-man Bi-Partisan Business Advisory Council of California to advise Governor Edmund G. Brown.

Kansas City Power & Light Co has appointed **W. C. McCarthy** manager of rates, and **L. S. Wright** administrative assistant to vice president Robert A. Olson. **Warren L. Porter,** vice president, retired recently.

Assistant vice president, production and distribution, **Chris H. Kraft,** Union Electric Co of Missouri, has retired.

Evelyn Hansen, home service director, Utah Power & Light Co, is listed in *Who's Who of American Women.*

Julian Hayes has been appointed publicity manager for The Anaconda Co.

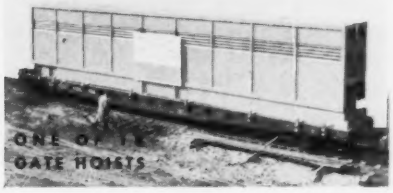
Myron D. Miller has been named secretary of the National Mineral Wool Assn. He was formerly a secretary for the National Electrical Manufacturers Assn.

Charles A. Collier has retired as a director of the Georgia Power Co. He becomes director of the Georgia Parks Department.

Henry G. Booker has been named director of the Cornell University School of Electrical Engineering.

C. A. Tatum, Jr., president and general manager of Dallas Power & Light Co, has been given the Linz Award for his civic activities in the city of Dallas.

Murco GATE HOISTS

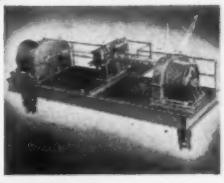


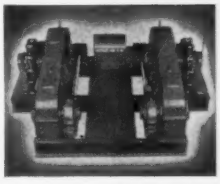
. . .TO CONTROL WATER LEVEL at LONG SAULT DAM, ST. LAWRENCE PROJECT

Each hoist weighs 93,000 lbs., shipped completely equipped with all electric motors, controls, limit switches, wired ready for operation . . . the overall length of one unit is 57 feet, 8½ feet wide, 12½ feet high . . . with a lifting capacity of 175 tons . . . will raise and lower the gates in the dam at a speed of 1 foot per minute.

MURCO GATE HOISTS . . . FOR ANY SIZE POWER DAM

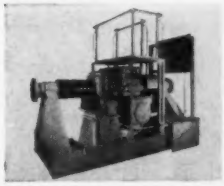
Capacities from less than 1 ton to over 100 tons.





From the smallest hand operated to the largest motor operated Gate Hoist.

Backed by over 75 years experience in design and manufacture.



Write for complete information and Engineering Department recommendations.

D. J. MURRAY MANUFACTURING CO.
MANUFACTURERS SINCE 1883
WAUSAU • WISCONSIN

Tornado

(*Continued from page 53*)

number of calls without becoming swamped.

• In a major emergency, the breakdown of the service area into smaller sections permits the marshalling of a large supplementary force to handle calls and analyze trouble.

• When the emergency reaches a certain point the distribution system dispatchers can call in the supplementary forces, according to a pre-determined plan.

For emergency plan purposes, storms are divided into three types.

1. Minor: Trouble department handles things routinely.

2. Severe storm: Number of overhead crews becomes large and operating department needs help to receive and analyze calls.

3. Extreme: All other departments are called in and other utilities are called for help, if necessary.

The emergency plan was developed for a major disaster but may be called into play for severe trouble in a limited area.

When the distribution dispatcher feels the plan should be set up he calls the T&D operating manager, who makes the decision. However, if he cannot be reached he has an alternate in the plan, as do practically all those who participate.

From that point calls go out to G. W. Gerell, the storm coordinator, who mobilizes the supplementary forces that are used in the plan.

The area is divided into three districts, and the emergency plan activities of each district are under the direction of the district engineer. Each district is divided into exchange areas.

Exchange Team Is Basic Unit

Basic unit of the emergency plan is the exchange team. Each exchange team is headed by an exchange analyst, who is an engineer. Working with him are a recorder and a field survey man.

When calls are referred to the exchange team they are spotted on the exchange area map. The telephone number, with the exchange, assists in referral of calls to the proper exchange team and in spotting calls on the map. The map pattern indicates type of trouble.

This information is given to the field survey man when he calls in on 45-minute intervals. He investigates the condition in the field and reports back. Orders for crews are then written by office members of the team.

When orders go to crews they have a pretty good idea what they have to do. Also, since the nature of the work is known, the job can be assigned to a crew of the proper size for handling it best.

Crews make hourly reports of progress and get new job assignments. The progress reports indicate to the storm coordinator whether he must arrange for additional help and whether he needs to shift crews.

The plan also provides for mobilization of customer service, employee relations and sales departments and the supply service division. When the tornado emergency arose, personnel department had the cervice center cafeteria opened by 6:30 am.

The purchasing and stores group arranges for rush-order material supply according to pre-determined lists of probable requirements for each crew size. Materials are delivered in "crew packages" to operating centers. Then, when crews are in the field, the stores department delivers materials to the work site.

Favorable Factors Helped

The entire operation during St. Louis' tornado emergency functioned with amazing smoothness, particularly since it was the first real test of the plan. However, Union Electric was quick to point out that they had a number of favorable factors such as: **1.** The storm's suddenness caused practically all the damage at once. **2.** Weather conditions were ideal following the tornado. **3.** Major troubles were localized in about three or four general locations. **4.** The plan was activated quickly and became effective before a work backlog accumulated.

Disadvantages included: **1.** Lack of warning and earliness of the hour.

2. Blocked streets and alleys, prevented movement of emergency forces in some areas.

3. Damaged telephone facilities which impaired communications between field and office.

–PROFESSIONAL SERVICES–

BLACK & VEATCH
Consulting Engineers
Electricity—Water—Sewage—Industry
Reports, Design, Supervision of Construction
Investigations, Valuations and Rates
1500 Meadow Lake Parkway
Kansas City 14, Missouri

THEODORE D. BROSS LINE CONSTRUCTION CORP.
Steel Tower & Wood
Transmission Lines
Distribution & Maintenance
175 Enfield St. Hartford, Conn.

COMMONWEALTH SERVICES INC.
Management and
Business Consultants
300 Park Ave
New York 22, N. Y.

ASSOCIATES INC.
Consulting and Design
Engineers
209 E. Washington
Jackson, Michigan

ELECTRICAL TESTING LABORATORIES, INC.
Electrical, Electronic, Environmental, Photometric and Chemical Laboratories. Testing, Research, Inspection and Certification.
2 East End Ave. New York 21, N. Y.

HOOSIER ENGINEERING COMPANY
Erection and Maintenance of Electrical Transmission and Distribution Lines
1350 Holly Ave., Columbus 16, Ohio

JENSEN, BOWEN & FARRELL
Engineers
Appraisals—Investigations—Depreciation Studies—Cost Trends—Reports
for Rate Cases, Security Issues, Regulatory and Accounting Requirements
Original Cost and Continuing Property Record Determination
Ann Arbor, Michigan

PIONEER SERVICE & ENGINEERING CO.
Consulting and Design
Engineers . . Purchasing
Specialists in Financing
Accounting and other Operations
231 So. La Salle St. Chicago 4

SANBORN MAP COMPANY
Nation Wide Mapping Services
• Utility Area Base Maps
• Symbolized System Portrayal
Atlanta - New York - Chicago - San Francisco

SARGENT & LUNDY
Engineers
140 South Dearborn St.
Chicago, Ill.

TIPPETT & GEE
Consulting Engineers
Mechanical • Electrical • Thermodynamic
Structural Design • Studies • Supervision
Power Stations • Transmission • Distribution
Industrial Plants • Process
1333 North Second Street Abilene, Texas

CLASSIFIED SEARCHLIGHT SECTION ADVERTISING

EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

DISPLAYED RATE:

EMPLOYMENT OPPORTUNITIES: $22.67 per inch. Subject to Agency Commission.

EQUIPMENT & BUSINESS OPPORTUNITIES: $16.85 per inch for all advertising appearing on other than a contract basis. Not subject to Agency Commission.

AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches—to a page.

EQUIPMENT WANTED or FOR SALE ADVERTISEMENTS acceptable only in Displayed Style.

UNDISPLAYED RATE:

$1.80 a line, minimum 3 lines. To figure advance payment count 5 average words as a line.

PROPOSALS, $1.80 a line an insertion.

BOX NUMBERS count as one line additional in undisplayed ads.

DISCOUNT OF 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals)

SEND NEW ADVERTISEMENTS TO Classified Advertising Div. of ELECTRICAL WORLD, P. O. Box 12, N. Y. 36, N. Y.

Sealed Bid Sale

GOVERNMENT SURPLUS PROPERTY

2:00 P.M. April 7, 1959

At Goodyear Atomic Corporation
AEC Plant, 22 miles North of
Portsmouth, Ohio, on U. S. Route 23

One complete used 15 KV indoor type metal clad twelve section switchgear substation, acquisition cost $132,764.00, will be sold by components listed on the Bid Forms, or as a complete unit.

Open for inspection 8:00 A.M. to 2:00 P.M.
March 30, 31, April 1, 2, 3, 6 and 7, 1959.

SALE NO. GAT-19-59

GOODYEAR ATOMIC CORPORATION
Phone Waverly, Ohio, 5-100, Ext. 2233

P. O. Box 628 **Portsmouth, Ohio**

ADDRESS BOX NO. REPLIES TO: Box No. Classified Adv. Div. of this publication. Send to office nearest you.
NEW YORK 36: P. O. BOX 12
CHICAGO 11: 520 N. Michigan Ave.
SAN FRANCISCO 4: 68 Post St.

POSITIONS VACANT

Wanted—University graduate Engineer with at least five years experience operation steam electric generating station for responsible position in Maracaibo, Venezuela. Preference will be given Spanish speaking applicant. Salary dependent on qualifications. P-8320, Electrical World.

Assistant or Associate Professor to develop a curriculum in Electrical Engineering and eventually be chairman, in a private Engineering School in Northern California College. Send detailed resume, references, recent photo. State salary. P-9986, Electrical World.

Wanted—Electric Distribution Engineer with college education and utility experience for employment in a position open with an electric utility company in southern Connecticut. Salary of $12,000.00 per year. Send resume of age and experience to P-9929, Electrical World.

Electrical Engineers Wanted—Several openings for graduate electrical engineers in engineering development work for semi-conductors and for heavy chemicals. Work involves design of control systems, plant assistance and evaluation work. Three to five years experience required in electrical engineering work. Good opportunity for growth and advancement. Midwest location. Salary depending on qualifications. P-1118, Electrical World.

SELLING OPPORTUNITY OFFERED

Manufacturer of substation equipment interested in securing live wire representative in the state of Ohio. RW-1098, Electrical World.

DON'T FORGET THE BOX NUMBER

SWITCHGEAR PLANT MANAGER

Graduate Engineer, early forties with minimum 10 years management experience in engineering and manufacturing phases of high voltage switchgear business, wanted to manage large switchgear plant of internationally known U. S. manufacturer of electrical distribution and control equipment. Unusual opportunity. Confidences respected. Send complete resume and salary requirements directly to company through—

P-1108, Electrical World
Class. Adv. Div., P. O. Box 12, N. Y. 36, N. Y.

New and Used Equipment Available for
POWER PLANTS, SUBSTATIONS, TRANSMISSION LINES AND CONSTRUCTION
Send for new list to
EBASCO SERVICES INCORPORATED
APPARATUS EXCHANGE **Two Rector St., New York 6, N. Y**

POSITION WANTED

Meter and Relay Specialist with administrative and organizational training and experience desires a challenging opportunity. Specialized training and experience in a first rate electric utility, in the testing and servicing of all types of metering and modern relay equipment, high voltage circuit breakers and central station apparatus. Best quality reference furnished. PW-9404, Electrical World.

If there is anything you want that other readers can supply
OR . . . something you don't want— that other readers can use—
Advertise it in the
SEARCHLIGHT SECTION

Readers Forum

"Excellent McClatchy Papers"

To the Editor:

The Electrical World editorial attack upon the public ownership principle as advocated by the excellent McClatchy newspapers is an affront to decency.

However, the EW fear is not surprising because in the well-managed Sacramento Municipal Utility District Mr. McClatchy left a living memorial that may rock the private power monopoly sector of the industry.

SMUD has good management and real advantages in tax exemption, use of some 2% REA money, use of some 4 mill Bureau of Reclamation power.

The results are indicated by a tale of two cities, Sacramento and Fresno, both of which were served by PG&E until January 1, 1947 when the SMUD acquired the Sacramento district PG&E facilities.

At that time the cost of 250 kwh for home use in both cities was $5.28 and the cost of 500 kwh was $7.78.

Eleven years later on January 1, 1958 according to FPC the Fresno rate for 250 kwhr had increased to $7.13 while the SMUD cut rates to $4.63, a difference of $2.50 per consumer each month or $30.00 per year. Sacramento citizens have an extra three million dollars in their pockets around Christmas time each year thanks to public power.

For 500 kwhr as of Jan. 1, 1958 the Fresno rate was $10.33, the Sacramento rate only $6.73, a saving of $3.60 per month.

In other words the Sacramento housewife can buy 500 kwhr of real electrical living for $6.73 and pay less than the PG&E victim in Fresno pays for 250 kwhr.

Twice as much power for the same cost is a typical public power accomplishment. Equally important is SMUD's $35-million in debt-free equity. McClatchy deserves much credit for his high-minded public leadership. It is paying off to the electrical consumer.

Gus Norwood
Executive Secretary
Northwest Public Power Association
Vancouver, Washington

Questions Bi-Monthly Billing

To the Editor:

An editorial in the Electrical World of January 19th, 1959, recommends serious study by U. S. utilities of the practice which Electricite De France proposes to follow —to read meters twice a year and bill bi-monthly on estimates based on the previous year's consumption.

Perhaps bi-monthly billing on the basis of estimated consumption deserves serious study, but if I were running a utility I should be very slow to adopt this practice. In this country the electric utilities look forward to constant expansion in the use of electricity, including before long a large volume of house heating loads. Inevitably electric bills will become a much larger part of the household budget than they are today. Conversely, meter reading and billing costs will decline as a percentage of total costs. Cumulation of charges for electric service would make them harder to pay and interpose an unnecessary obstacle to load growth. At the consumption levels already prevailing in the Tennessee Valley bi-monthly billing would create great problems of customer relations.

My point does not go so much to the frequency of meter reading as to the frequency of billing. Most merchandisers are trying to make it easier for customers to buy, and the electric utilities might well be thinking along the same lines.

Joseph C. Swidler
Attorney-at-Law
Nashville Trust Building
Nashville 3, Tennessee

MOVING?

We need your new postal zone number, as well as your change of address.

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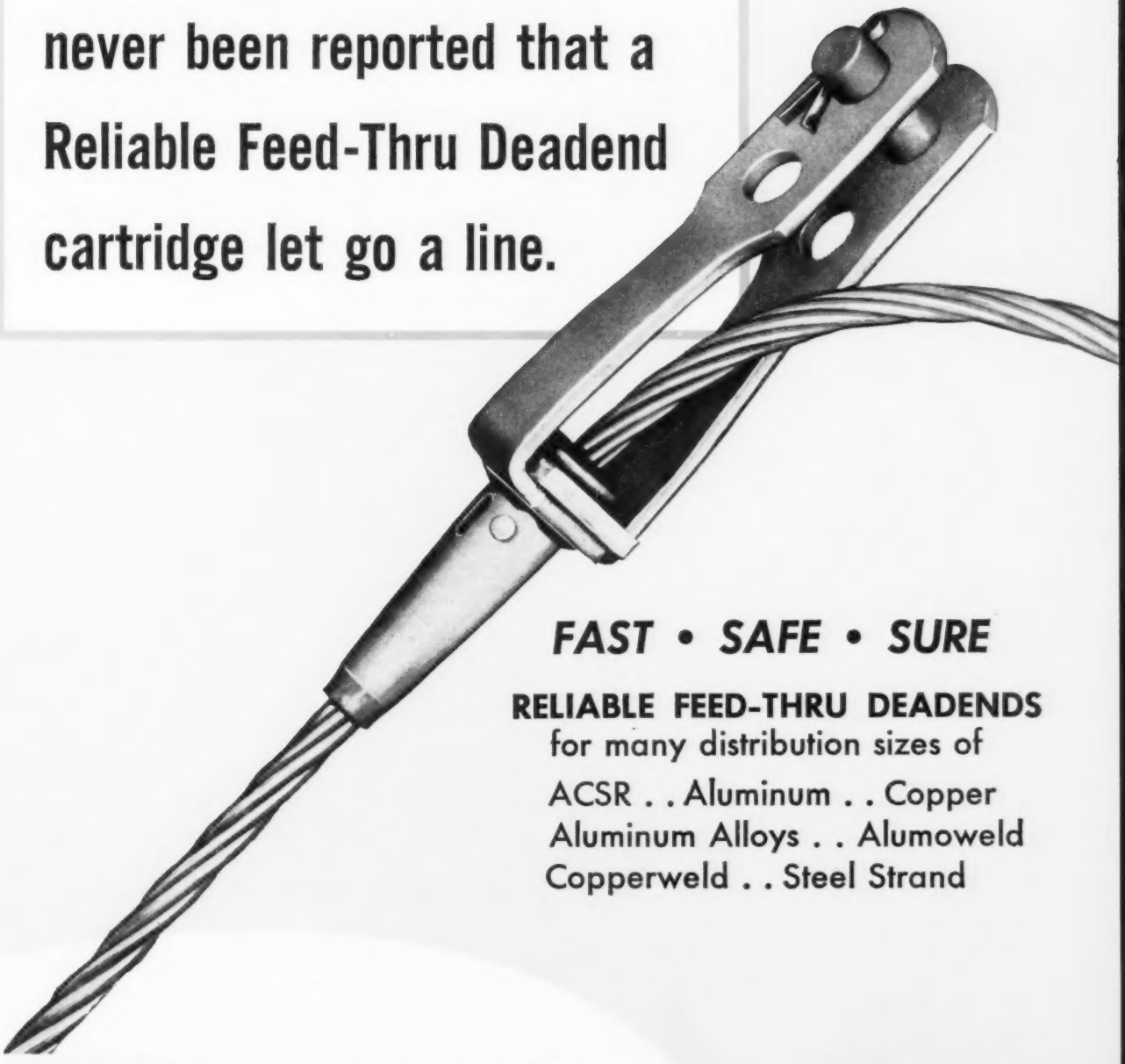

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